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Nationalizing the Work of Associations

ASSOCIATIONS and societies have multiplied within the electrical industry. The directory of electrical associations printed by the ELECTRICAL WORLD in the first issue of each month lists ninety-three such associations, clubs and societies. The co-operative spirit which this willingness to exchange ideas within the industry exhibits is without doubt one of the fundamental reasons for its remarkable growth since the Centennial in 1876. With the growth in size and complexity within the industry, however, has come an overlapping and duplication of functions between organizations. This duplication of effort has been recognized by many of the associations, and for several years the executive officers of various organizations, notably the American Institute of Electrical Engineers and the National Electric Light Association, have given this problem serious consideration. Because of this tendency the announcement that the Electric Vehicle Association voted at its recent meeting in Cleveland to consider affiliation with the National Electric Light Association deserves special commendation. Both the great national associations, the A. I. E. E. and the N. E. L. A., are broad enough in their conception to draw into their membership local or group associations with either scientific or commercial objects. The presidents of both these national organizations are actively interested in this movement, and the coming year should witness the practical carrying out of a sound policy. Affiliation and amalgamation need not involve the suppression of individuality. Rather, they may conserve this important element in progress by giving greater scope to geographical or other specially grouped organizations, federated into two national bodies for the common good.

The Business of Homekeeping

WE wonder if the time has not now come when men and women are ready to consider in a comprehensive way their business of homekeeping. In other words, have we not progressed sufficiently to go a step beyond the simple buying of appliances from time to time and to calculate the value of complete equipment for efficient operation? The simple method in the past has been to sell appliances, one by one, to the woman who manages the housework. Experience proves, however, that much of this apparatus will be purchased with little forethought. Much of it will fall into disuse soon after. Much of it will stand for luxury rather than economy. The idea of the efficiency of this modern household machinery will be impressed less deeply than the thought of its convenience and its cost. Surely there is an opportunity for the central station to present its proposition for the electrical equipment of the home on the broad basis of economics by discussing with man and wife together the modern problems of housekeeping and the ways in which electric service can be utilized to aid home efficiency.

Attacks on Commission Regulation

THE wish being father to the thought, commission regulation was foredoomed to failure by many. That the principle has taken root, flourished and become part and parcel of established law shows its soundness. If it is not now to be overthrown, however, it is encumbent on all, economists and utilities alike, to make sure that regulation does not grow fat by what it feeds on. Dissatisfaction with the law, with the commissions or with the principle itself has manifested itself frequently of late. Only last week Kansas, hampered by an inadequate law to which the municipal plants that abound in the State are not amenable, voiced the need of a new measure. Next week New York will vote on a constitution one provision of which will effectively remove its public service commissions from politics by endowing them with judicial functions. While these are distinct steps in advance, attack from an entirely new direction is threatened. Senator Borah of Idaho, one of the giants of the Republican party, has let drop a hint which is worthy of serious consideration. The European war, he says, will have advanced state socialism in five years more than it has advanced during the last hundred years. The next great political issue in this country will therefore involve government ownership of public utilities. Regulation, in the minds of many people, has broken down. It is not satisfactory to the public nor to the owner of the property. Efficiency in this war has come from those countries most highly and pronouncedly given over to state socialism, and the question will be asked, If it gives efficiency in war, why shall we doubt that it will give efficiency in peace?

Wiring Specifications by Experts

SOME sort of closer co-operation is vitally necessary between architects and electrical contractors. Under the present situation one of two evils often arises—either the architect prepares specifications without adequate technical knowledge or he forces the duty upon an electrical contractor. It might not be amiss to point out that the preparation of electrical specifications is a special service, worthy of compensation; and if a contractor does it he should be paid for it as for any other

kind of technical service. Architects also should consider the preparation of electrical specifications a distinct service, to be performed by an expert, not only for the purpose of satisfying their customers but also for their own protection. For if an electrical expert were interested in the plans in their inception he might recommend modifications and improvements, which are not always possible of adoption after the customer has approved the architect's sketches.

Carrying the idea of compensation for special service further, the unfairness of accepting gratuitous suggestions from competing electrical contractors is obvious. Ordinarily only the successful bidder or the contractor who gets the electrical work has the opportunity to make suggestions; but if a small fee were paid to competitive bidders, or if an understanding prevailed that suggestions would be paid for if adopted, all bidders would be encouraged to make recommendations. Many a valuable idea is lost to the profession because the originator was unwilling to make a present of it to a builder who gave the job to a competitor.

Experience with Electrical Cooking

FROM the practical standpoint the report of the electric-range committee of the Northwest Electric Light & Power Association contains an amount of information that well rewards study. It should be noted at the start that the committee was dealing generally with the States in or west of the Rocky Mountains, where as a rule coal is high and energy is obtained from hydroelectric plants, both favorable conditions for the development of the cooking load. With respect to the general requirements of such load, however, and its effect on the central station, locality makes no especial difference. Data were obtained from more than 900 communities with a gross population of more than 4,000,000. The forty-four companies which reported on their electric-cooking customers showed nearly 2500 as an aggregate, with a probability of an addition of nearly double this number within the next year.

From the standpoint of the central station the points of importance in assuming electric-cooking load are the income obtainable, the effect of the service on peak load, and the price at which the business expands freely. To begin with, the yearly revenue varies greatly from community to community. Business in some places is active for only a few months of the year, but, taking the whole group, $4 to $5 a month appears to be about the amount which can be anticipated on meter prices ranging from 2 cents to 5 cents per unit, averaging about 3 cents. Income from apartment houses, which seem to be an extremely promising field for cooking load, runs slightly under these figures, owing probably to the generally smaller number of persons per family. The somewhat meager data at hand from this particular class of business indicate an average use of about 1 kw.-hr. per person per day, a figure which would certainly be increased were the service extended into general residential districts.

As regards the effect of the cooking load on the load curve of the station, most of the plants reporting noticed no effect whatever from the moderate amount of cooking handled, and most of those that noticed any change found that it was in the direction of a better load curve, although a few plants reported a slight increase in the peak. These general results are quite in agreement with those obtained in England, where special efforts have been made to secure cooking load, with the general result of finding that it did not perceptibly affect the peak, while it tended to furnish somewhat better day load. Evidently the average effect of load used for general heating purposes would likewise be mainly off the peak, thus again helping out the central station.

With respect to the price at which electrical energy must be sold to make electric cooking thoroughly practicable and build up the demand, the data accumulated by the committee are too various to permit of accurate deductions. The general indications are that a rate between 2 cents and 3 cents will get an amount of business well worth taking on, and that the lower of these figures will enable the acquisition of a large amount of service. A 2-cent rate, in fact, makes a casual use of electricity for auxiliary heating purposes practical and economical, and in mild climates should lead to the development of a very large amount of such business. The difference in this respect between a 2-cent and a 3-cent rate is very marked. As regards the comparative cost of cooking with coal, gas and electricity, the last-named has a huge advantage in its higher efficiency of utilization. In climates where a coal range is not necessary for heating purposes electric energy at 2 cents to 3 cents per kilowatt-hour can probably beat out coal in most instances. With respect to gas the figures in the committee report are somewhat various, but they point to easy competition when electric prices are down to 2 cents or 3 cents.

The main difficulty in the introduction of electric cooking lies in the cost of the ranges and the cost of heating considerable quantities of water. The cost of heating water by either gas or electricity is high. This difficulty is met in English practice by the installation of small independent hot-water heaters installed in the kitchen and operated with coke. Both gas and electricity require more intelligence for economical results than ordinary fuel. Hence it is often found that the use of energy per person in electric cooking where the apparatus is trusted to the ordinary cook rises noticeably higher than the figure we have just noted, up to 1.5 kw.-hr. or even 2 kw.-hr. per person per day. But precisely the same result follows from the unskillful use of gas. The average cook never seems to grasp the idea that she cannot raise the temperature of boiling water by boiling it more furiously. The really economical results with either are obtained by intelligent attention, and hence probably come the low figures found in apartment-house work, where the housewife herself is likely at least to keep an eye on the operation. The cost of apparatus will surely come down as the demand increases, so that the outlook will be increasingly good.

Steam Condenser Design for Overloads

THERE has been much just and unjust criticism of condenser operation for prime movers in steam-electric stations. The placing of the blame for the shortcomings of the apparatus seems to depend on the angle from which the matter is viewed, that of the designer or the operator. Fortunately, however, both sides have agreed upon the location of the real difficulty, with the result that improvement in performance of condensers is now expected to come from a reduction of the pressure loss through the apparatus. This will permit the handling of steam from the turbine with a maximum vacuum when operating at the most economical rating and at a temperature for the circulating water that represents the average for the year. Work now under way is certain to result in useful data for determining the size of condensers that will give uniformly economical operation for turbines under varying loads. An ingenious development which should have a place in future designs for plants of small size is described elsewhere in this issue. It combines a barometric principle with a surface condenser design. Absence of baffles in the condenser tubes aids free circulation of the steam, and the jet feature takes care of the overload on the apparatus and permits the normal rating to be ample for the average or most economical load. A wet vacuum pump is not required since the barometric feature takes care of the condensate, with the general arrangement facilitating cleaning and draining. Such a design has advantages for a small station with heavy peak loads, but may serve larger units where space is available.

Development of the Incandescent Electric Lamp

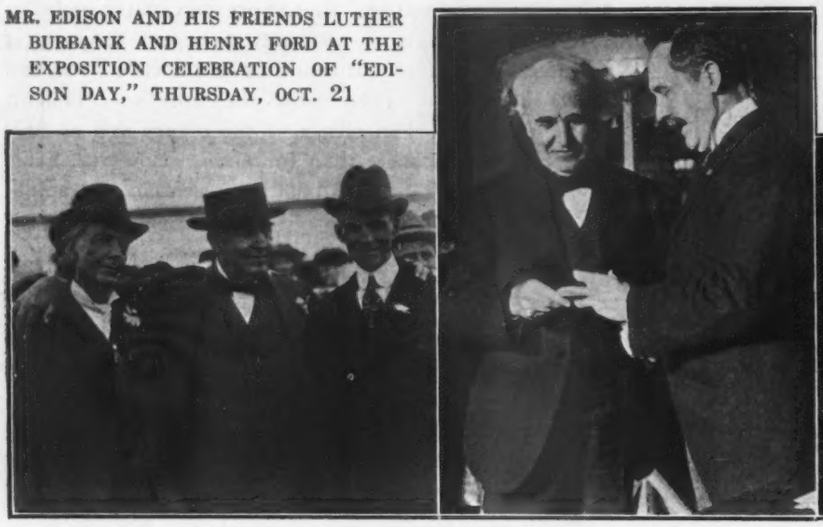
THE celebration of the thirty-sixth anniversary of the invention of the incandescent electric lamp leads to reflection and comparison. How different from earlier practice has been the development of the modern incandescent lamp! The industrious and rather crude experimenting of the early days has given place to a precise, painstaking, scientific attack on the difficulties of the problem which is producing results at a rate that is both astonishing and exceedingly gratifying from a commercial standpoint. The investigations which have produced the metallic-filament lamp in its present form have been masterpieces of physical and chemical research. First came the work of Auer von Welsbach, one of the brightest technical chemists of our generation, on the osmium filament. This metal, although giving the highest useful selective radiation, is not quite refractory enough to make a satisfactory commercial filament and, what is more serious, is far too scarce to be considered, being, practically speaking, a rather meager by-product of the platinum industry. After the osmium lamp came the tantalum lamp, the product of most patient and skillful chemical research in the Siemens & Halske laboratory. Less efficient than the osmium lamp, the tantalum lamp really made the first commercial break from the old line of incandescent-electric-lamp manufacture. Had it proved capable of being used to advantage on alternating-current circuits, it might have survived, for tantalum is a ductile metal and fairly abundant. Then came the tungsten filament, more refractory than either of the others and at first much less manageable than tantalum. However, after several years of most exhaustive research, the actual wire-drawn filament was evolved in the laboratories at Schenectady, and within the past year the gas-filled tungsten lamp. It is a tribute to the genius of Edison to note that minus the filament the incandescent lamp does not differ in essentials from the lamp of years ago. The filament has been improved immensely, however, so that, in addition to a much longer life, the specific energy consumption of the modern lamp is only a small fraction of what it was even ten years ago. Certainly the improvements of the last year show the value of research laboratories, and the thorough and scientific study of the lamp now being made is a guarantee of greater gains in the near future.

Economy Due to Outdoor Construction

ENGINEERING design to-day is going hand in hand with economic tendencies. Different links in the chain of the generating and distributing mechanisms of the electric system are being closely scrutinized for possible elimination of high first costs, capital charges and upkeep charges. The development of the outdoor type of substation, and more recently of the automatic substation, are cases in point.

Only a short time ago outdoor switching was an open experiment; to-day it constitutes standard engineering practice and is an index to progress in design of control apparatus for use at distribution points and at generating stations both of the steam and water-power type. Outdoor as against indoor switching and control shows up most favorably when initial costs are considered. In the case of an Eastern system operating several small substations at 66,000 volts more than half the cost of the indoor structures has been saved by outdoor designs. After allowing for the extra cost of the outdoor apparatus and the cost of the foundations and the steel work required, there was a saving of 11 per cent on the expenditure represented by the complete substation and equipment. The outdoor construction has thus far been largely confined to substation designs to step down the transmission voltage for distribution, but there seems to be no good reason against a further development which will include the installation out of doors of motor-generators and rotary converters of small rating for interurban railway service. The operation of motors on street cars and electric vehicles has proved their dependability in all kinds of weather. With a similar protection by concrete shed or like construction the outdoor installation of rotating apparatus of substantial character should soon become a part of the outdoor-equipment family, with resulting economies in extensions of electric-railway service at the boundaries of our growing cities.

MR. EDISON AND HIS FRIENDS LUTHER BURBANK AND HENRY FORD AT THE EXPOSITION CELEBRATION OF "EDISON DAY," THURSDAY, OCT. 21



MR. AND MRS. EDISON AND SAMUEL INSULL AT THE EVENING SCINTILLATOR AND FIREWORKS DISPLAY ARRANGED IN MR. EDISON'S HONOR

"Edison Day" at the San Francisco Exposition, Oct. 21. The Inventor Receives a Medal from President Moore of the Exposition

A Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

CONFERENCE ON SAFETY CODE

Four Committees in Session All Week in New York Revising Proposed Code of Bureau of Standards

The most important conference thus far held on the proposed safety code of the Bureau of Standards is in session at the headquarters of the American Institute of Electrical Engineers in New York at the present time. Sub-committees met all week and will continue their deliberations next week until a general agreement on all important points is reached. Represented in the conference are the Western Association of Electrical Inspectors, the Associated Manufacturers of Electrical Supplies, National Electric Light Association, Association of Edison Illuminating Companies, Electrical Manufacturers' Club, Bureau of Standards, American Electric Railway Association, Canadian Electrical Association, the Northwest Electric Light & Power Association, the American Institute of Electrical Engineers, the National Electrical Contractors' Association, the Underwriters' Laboratories, the New York Central Railroad, the Pennsylvania Railroad, the Wisconsin Industrial Commission, the Western Union and Postal Telegraph companies, the American Telephone & Telegraph Company and allied interests, central stations of central and southern California, the Westinghouse, General Electric and other manufacturing companies, and the California Industrial Accident Commission.

In opening the conference last Monday morning Dr. Rosa of the Bureau of Standards explained the method followed by that institution in obtaining information and told how the country was canvassed. He expressed regret at the postponements of the various conferences which were scheduled to take place in Washington at the offices of the Bureau of Standards, but said there were good and sufficient reasons for the postponements.

J. W. Lieb, representing the lighting companies, reviewed briefly their attitude toward the proposed code, and said it was the desire of the lighting companies to co-operate with the Bureau of Standards in its work to the intent that quick action might be secured and a workable code as well. It was agreed that only constructive criticism would be offered. P. M. Downing of the Pacific Gas & Electric Company, San Francisco, representing the lighting companies of central California, spoke, as did J. B. Fisken of the Washington Water Power Company, Spokane, Wash.; J. C. Martin of the Pacific Power & Light Company, Portland, Ore., and G. E. Quinan of the Puget Sound Traction, Light & Power Company, Seattle, Wash., representing the Northwest Electric Light & Power Association. The conditions confronting the electrical industry on the Pacific Coast were outlined, and the various speakers expressed their willingness to co-operate in drafting reasonable rules that they could support in their respective territories. R. E. Eltringham of the California Industrial Accident Commission, W. S. Boyd and Dana Pierce of the insurance interests, H. S. Warren of the Bell telephone company, and R. S. Hale of the National Electric Light Association's wiring committee also addressed the meeting.

Work in Hands of Four Committees

In order to expedite the work a committee of procedure arranged for four sub-committees. The morning sessions were given over to a general discussion of the subjects which would in turn be taken up by the various sub-committees during the afternoon. The personnel of the various committees is as follows:

Station.—D. W. Roper, Commonwealth Edison Company, Chicago, chairman; Philip Torchio, New York Edison Company; G. E. Quinan, Puget Sound Traction, Light & Power Company, Seattle; P. M. Downing, Pacific Gas & Electric Company, San Francisco; N. A. Carle, Public Service Electric Company, Newark, N. J.; C. L. Cadle, New York State Railways, Rochester, N. Y.; C. W. Stone, General Electric Company, Schenectady; C. E. Skinner, Westinghouse Electric & Manufacturing

Company, East Pittsburgh; L. L. Elden, Edison Electric Illuminating Company of Boston; R. L. Eltringham, California Industrial Accident Commission, San Francisco.

Line.—R. J. McClelland, Electric Bond & Share Company, New York, chairman; R. E. Chatwood, Western Union Telegraph Company, New York; J. C. Martin, Pacific Power & Light Company, Portland, Ore.; Farley Osgood, Public Service Electric Company, Newark, N. J.; W. K. Vanderpoel, Public Service Electric Company, Newark, N. J.; P. Spencer, United Gas Improvement Company, Philadelphia; T. Sproule, Philadelphia Electric Company; H. S. Warren, American Telephone & Telegraph Company, New York; W. J. Harvie, Allen & Peck, Syracuse, N. Y.; E. B. Katte, New York Central Railroad Company; H. W. Pinkerton, Pennsylvania Railroad Company, Altoona, Pa.; S. B. Way, Milwaukee (Wis.) Light, Heat & Traction Company; C. S. Ruffner, Union Electric Company, Webster Groves, Mo.

Utilization.—R. S. Hale, Edison Electric Illuminating Company of Boston; H. B. Gear, Commonwealth Edison Company, Chicago; H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; W. S. Boyd, Western Insurance Union, Chicago; H. S. Osborne, American Telephone & Telegraph Company, New York; S. G. Rhodes, New York Edison Company; H. R. Sargent, General Electric Company, Schenectady; J. W. Perry, H. W. Johns-Manville Company, New York; E. McCleary, National Electrical Contractors' Association, Detroit; Dana Pierce, Underwriters' Laboratories, New York; W. A. Mitchell, Great Western Sugar Company, Denver.

Operation.—P. Junkersfeld, Commonwealth Edison Company, Chicago, chairman; J. B. Fisken, Washington Water Power Company, Spokane; J. L. Murrie, New York Edison Company; T. A. Kenney, Consumers' Power, Railway & Light Company, Jackson, Mich.; F. C. Sargent, C. H. Tenney & Company, Boston; W. C. L. Eglin, Philadelphia Electric Company; E. Miller, American Telephone & Telegraph Company, New York; C. B. Scott, Commonwealth Edison Company, Chicago.

Monday afternoon was given over to the consideration of the operating rules, when various objections were received from the Northwest and other associations. The rules on stations were taken up for general discussion on Tuesday morning, with the sub-committee in session during the afternoon.

On Wednesday the utilization committee was in session considering the rules of that division of the code, and on Thursday and Friday the lines committee was at work. Saturday was given over to reports from the four sub-committees, and all of the work not having been completed, it was agreed to continue it next week until all important differences are harmonized.

Chicago Engineers Honor Steinmetz

Tuesday, Oct. 26, was Steinmetz day in Chicago. At noon Dr. Steinmetz spoke of electric-power development before the Electric Club-Jovian League, emphasizing his previously expressed belief that the electric transmission lines will some day form as complete a network over our country as do the railroads to-day, making it possible for people to live with as much comfort and convenience in the country as in the cities. In the evening, speaking before a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers, Dr. Steinmetz predicted continually increasing efficiency in electric illumination. Where it is now possible to produce light with an efficiency of 2 per cent, he said, we shall not many years hence be able to produce it with an efficiency of perhaps 20 per cent.

NATION-WIDE HOMAGE TO EDISON

Celebration of Edison Day at Panama-Pacific International Exposition and at Laboratories in West Orange, N. J.

At every public appearance in San Francisco Thomas A. Edison received an ovation not surpassed by that accorded any other visitor who has thus far attended the Exposition. A crowd of more than 10,000 waited outside when Festival Hall was filled to its capacity by those eager to see the medal presented, and greater numbers lined the streets on several occasions, waiting to catch a glimpse of the inventor when he should pass in an automobile. Spontaneous tribute was given him on every hand in a way that demonstrated clearly the great esteem in which Mr. Edison is held by the general public of the Exposition city.

Traveling over the Union Pacific Railroad in the private car of Henry Ford, Thomas A. Edison and Mrs. Edison arrived in San Francisco on Oct. 18 to take part in the Exposition celebration of "Edison Day," Oct. 21, the thirty-sixth anniversary of the invention of the incandescent light. Mr. Edison, "the wizard of the East," was greeted at Sacramento by Luther Burbank, "the wizard of the West," after which the two men were almost constantly together during the preliminary visits to the Exposition and the points of interest in and around the city. In commenting on the meeting with Mr. Burbank, Mr. Edison said: "There were only three of us who searched in the same way—Ehrlich, Burbank and myself—and now Ehrlich is gone. We all threw out thousands of experiments and then watched nature work with them until she showed us what to do. That's why I'd rather meet Burbank than any other man in all the world."

Edison Fêted in San Francisco

The mayors of seven cities around San Francisco Bay issued proclamations requesting a general illumination of the several cities on Tuesday evening, Oct. 19, in honor of Mr. Edison. In all municipal and office buildings, apartment houses, residences, and in short wherever there were electric lights, the current was turned on for the occasion, and the Edison party was taken through the city in automobiles to see the display.

Prior to this inspection trip Mr. Edison was the guest of honor at a telegraphers' banquet at which the only speechmaking was done by telegraph tickers. Mr. Edison said it was the first banquet he had attended at which he could both talk and hear all that was said. On each table of the banquet room were a sounder and a miniature telegraph pole. These were strung with wires running from table to table so that all the sounders could be cut in on the same general circuit. Mr. Edison's place was provided with a special resonator which enabled him to hear every word of the speeches, and he ticked off a short message himself to his old-time telegrapher friends.

At noon on Wednesday, the day prior to Edison Day, Mr. Edison was entertained by the Society for Electrical Development and the Jovian League at a joint luncheon in the Commercial Club's headquarters. John A. Britton presided as toastmaster, and Samuel Insull spoke for Mr. Edison. In addition to the three guests of honor—Edison, Burbank and Ford—the following were among the invited guests present: A. Hammersmith, S. W. Gillman, F. D. Fagin, Fred Sargent, W. D'A. Ryan, George C. Holberton, Charles L. Edgar, P. S. Teller, Dr. Thomas Addison, H. V. Carter, C. C. Hillis, William Bee and John H. Rycraft. More than 300 members and guests were turned away after every seat in the dining-room was taken.

Edison Day at the Exposition was crowded with features intended to make the exercises and festivities

commensurate with the distinction of the genius they honored.

Ceremonies scheduled for 2.30 p. m. in Festival Hall were delayed nearly an hour while the Edison automobile was making its way through the crowds that thronged its route. Its arrival at the hall was cheered by more than 10,000 people who could not get inside to witness the ceremonies.

John A. Britton, president of the Pacific Gas & Electric Company, who acted as chairman of the day, characterized Edison as "not only a great inventor, but a great humanitarian as well." In commenting on the achievements in electrical development, Mr. Britton said: "Out of the darkness of the past the name of Thomas A. Edison has been inscribed on the future of the world. Thomas Edison is on a plane by himself. His inventions have been for the benefit of mankind. He has advanced civilization. He is a hero of peace, no less renowned than any hero of war."

In presenting to Edison the bronze commemorative medal as a mark of the Exposition's appreciation of the inventor's visit, Mr. Moore said: "Thomas A. Edison stands for humanitarianism, for love of mankind, for patriotism. He has worked and is working for human advancement. He has received other medals, other tokens of regard, but I know that nothing of that sort ever bestowed upon him carries with it a richer sentiment or expression of truer friendship than does this simple bronze medal which I present to him on behalf of the Panama-Pacific International Exposition."

In responding to Mr. Moore on behalf of Mr. Edison, Samuel Insull, president of the Commonwealth Edison Company, Chicago, briefly reviewed the life work of the inventor, referred to some of the early predictions that have now been fulfilled, and closed by saying that he believed Mr. Edison's continual refusal to be discouraged by disappointments was one his greatest characteristics.

At 6 p. m. the entire Edison party were guests at a dinner given by Dr. Thomas Addison, Pacific Coast manager of the General Electric Company, in the "home electrical" exhibit in the Palace of Manufactures. Every item on the menu was cooked in electric chafing dishes in full view of all the guests.

The illumination program was arranged as a climax to Edison Day, and W. D'A. Ryan, chief of illumination, employed every improvement that has been developed since the unique system was installed in an effort to surpass all previous occasions. A feature of the display was the motion pictures of the Edison party, completed only a few hours earlier, which were projected on a screen in full view of the entire gathering.

After the scintillator drill and the fireworks display were over a set piece was fired showing Edison holding aloft an electric lamp. Underneath were the words: "Thomas A. Edison—1879-1915." This was the signal for touching off half a ton of explosives. There was a deafening salvo of bombs, and rockets soared upward, bursting in all directions in salute of the set piece. Between 20,000 and 30,000 people witnessed the display, and at its close there were spontaneous cheers for Ryan, followed by others for Edison and Mrs. Edison. An illuminated aeroplane flight by Charles Niles concluded the day's program.

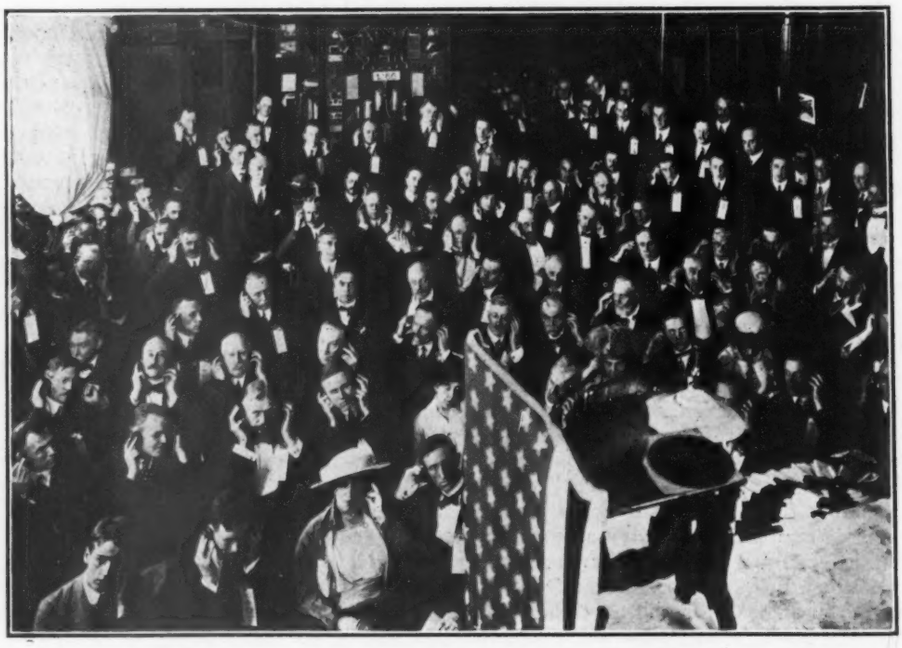
Celebration at West Orange

Seated about the library in the laboratory at West Orange, N. J., where the famous inventor spends most of his hours, with telephone receivers at their ears, old-time associates, members of his family and others listened to the voice of the distinguished man who was observing Edison Day at the Panama-Pacific International Exposition, 3400 miles away. With characteristic good humor Mr. Edison joked with the folks who sent their congratulations over the transcontinental lines. Replying to a phonographic speech by M. R. Hutchinson sent over the line, Mr. Edison said in part:

"It may seem strange to those who know of my work on the telephone carbon transmitter that this is the first time I have ever carried on a conversation over the telephone. Trying to talk 3400 miles on my first attempt at a telephone conversation seems to be a pretty big undertaking, but the engineers of the Bell system have made it easier to talk 3400 miles than it used to be to talk 34 miles."

During these proceedings J. J. Carty, chief engineer of the American Telephone & Telegraph Company, on the wire in Chicago, told Mr. Edison of the successful transmittal of the human voice by wireless from New York to Paris.

Among the old associates and friends of Mr. Edison at the West Orange celebration were John W. Lieb, Frank J. Sprague, W. J. Hammer, T. C. Martin, E. H. Johnson, George F. Morrison, J. N. Kingsbury, W. H. Meadowcroft, Sidney B. Paine, Charles S. Bradley, J. C. Walker, Charles L. Clark, F. R. Upton, T. B. Shaw, John Ott, Schuyler S. Wheeler, Charles Wirt, M. F. Moore, Peter Cooper Hewitt, Spencer Miller, Elmer A. Sperry, Edward Marshall, Gerard Swope, H. F. Thurber and J. A. Stewart.



FAMILY, FRIENDS AND OLD ASSOCIATES OF MR. EDISON GATHERED IN HIS PRIVATE LABORATORY AT ORANGE, N. J., LISTENING TO THE "EDISON DAY" ADDRESSES AT SAN FRANCISCO BY TELEPHONE. IN THE FOREGROUND ARE THREE OF MR. EDISON'S SONS, THEODORE, CHARLES AND THOMAS A., JR.

WISCONSIN CONSIDERS SAFETY RULES

Hearing Before Commission at Madison Brings Out Opposition from Telegraph, Telephone, Electric-Light and Industrial Power-Plant Men

More than 100 men, representatives of nine distinct interests in the electrical industry, were present at Madison on Oct. 22 at the first open hearing on standards of electrical construction and operation held before the Railroad Commission of Wisconsin. The interests represented were the central station, telephone, telegraph, industrial plant, electrical manufacturer, consulting engineer, electrical inspection bureau, college professor, and railroad commission. The meeting was to have been a joint one with the Industrial Commission of Wisconsin, but the expected member of the Industrial Commission failed to appear.

Why the Hearing Was Held

The adoption of rules governing standards of electrical construction and operation in Wisconsin was made necessary by a law passed in 1915 which empowered the Railroad Commission to pass on inductive interference disputes. The tentative rules which the commission proposed were copied largely from those now used by the California commission and those proposed as federal rules by the Bureau of Standards at Washington, D. C. To give operating men an opportunity to criticise the proposed rules and to suggest changes adapting the rules to Wisconsin conditions the joint meeting of the two commissions was planned.

High-Tension Transpositions Discussed Pro and Con

Under the sub-topic of "interference," a power circuit was defined by the tentative rules as "any overhead constant-potential alternating-current power transmission or distribution circuit or electrically connected network which has a voltage of 5000 volts or more between any two conductors or of 3000 volts or more between any conductor and ground." Objections to setting the low-potential limit at 5000 volts was voiced by both the central-station men and the telephone men. The latter contended that 5000 volts was too high as a limit and suggested omitting the mention of any specific figure. Central-station representatives declared that power companies should not be compelled to build 6600-volt and 66,000-volt lines of the same type of construction and suggested that the dividing line between low-potential and high-potential circuits be placed between 6600 volts and 13,200 volts.

The proposed rules stated further that "the minimum horizontal separation between a power line and a communication line shall be equal to the height of the taller line." Considerable objection was raised to this rule, and a substitute rule recommended for it provided that the lines should be placed on opposite sides of the highway where possible. A question was also raised as to what jurisdiction the commission had over lines on private rights-of-way.

The real bone of contention in the discussion on interference, however, was found in the rule requiring transpositions in high-tension circuits paralleling communication lines. As presented the rules required all power circuits to be transposed inside the limits of the parallel at intervals as frequent as requested by the communication company, provided that the request did not call for successive transpositions closer than every sixth of a mile. In the argument the central-station representatives pointed out the facts that high-tension transpositions place extraordinary expense and inconvenience on power companies, that sleet loads on transposed lines produce short-circuits, that transposed lines cannot be patrolled efficiently by men aboard railway trains, and that transposing high-potential lines does not always remove interference troubles.

The telephone engineers in attendance were firm in demanding transpositions in power lines. The central-station men, however, expressed the belief that other less expensive and more satisfactory means of eliminating interference were available and recommended that the rule demand high-tension transpositions only when no other means could be found for eliminating interference troubles.

The Value of the Service Considered

Over a rule stating that "a power circuit involved in a parallel shall not be operated at any time with an open, grounded or short-circuited line wire or wires or transformer winding" the question of considering the value of the service affected arose. Central-station representatives contended that power lines serving important communities should be allowed to utilize temporarily any of these abnormal operating conditions when necessary to insure continuity of service if the telephone utility affected was comparatively inconsiderable.

Contemplate Limiting Use of Air-Brake Switch

One paragraph in the rules on switching said: "The use of air switches on a power circuit involved in a parallel is prohibited except for the purpose of isolating sections of dead line or for disconnecting transformers under no load." To point out the injustice and needlessness of such a rule one switch manufacturer filed a brief setting forth comparative test data showing that the operation of air switches creates no greater line disturbances than that of oil switches. The brief quoted at length from an article by Charles E. Bennett published in the ELECTRICAL WORLD of Oct. 16, 1915.

Another rule in the tentative draft proposed that all electrolytic lightning arresters on circuits involved in a parallel be charged between the hours of 2 a. m. and 4 a. m. Since this rule in effect requires a night man at each arrester station, it met with opposition. It was also contended that since some manufacturers recommended charging arresters twice a day two charging times should be allowed.

Safety Rules Considered Briefly

The lively interest which marked the discussion of rules on interference was to some extent lacking in the later consideration of safety rules. As published by the commission the safety rules were a condensed and abridged copy of the rules issued by the Bureau of Standards on April 29. Most of the objections to these rules were met by statements from the commission's engineers to the effect that corrections in subsequent editions of the rules had changed the objectionable statement.

No Provision for Automatic Substations

In the proposed rules for operation and maintenance appeared the statement, "A qualified employee shall be kept on duty where generators or rotary converters are operating." On the score that the installation of automatic substations is being seriously considered by some Wisconsin companies this rule was considered too narrow. The requirement that all disconnecting switches should be locked when open was held to be too rigid for small companies.

Industrial Plant and Telegraph Men Object

Not a few of the objections to the rules came from operators of industrial plants and representatives of telegraph companies. The main contention of the

former was for the right to construct new lines or add to the existing plant without being required first to consult the engineering department of the commission. The telegraph representatives declared the rules entirely irrational and unreasonable, and inapplicable to telegraph conditions, and asked for a separate code specially drawn for such work.

The Commission's Stand

Walter Alexander, the commissioner presiding at the meeting, declared that it was not the intention of the commission to adopt the rules as they stood, but that the opinions of operating men were desired. He said further that in all probability no rules would be adopted until after the representatives of the federal Bureau of Standards had met with representatives of the electrical interests of the country to revise the proposed federal rules.

FAULTY UTILITY REGULATION IN KANSAS

Kansas Gas, Water, Electric Light and Street Railway Association in Convention Voices Sentiment for Adequate Legislation

The eighteenth annual convention of the Kansas Gas, Water, Electric Light and Street Railway Association was held at the National Hotel, Topeka, Oct. 21, 22 and 23. President H. W. Magruder presided over the meetings. The prevailing sentiment of the meetings was a pronounced dissatisfaction with the public utilities law of the State, which was evidenced by one of the papers read. The law is a semi-adequate measure of regulation, and a revision which would bring all the utilities of the State within its jurisdiction would be welcomed. There was no intimation of prejudice against public regulation, but rather a desire for an adequate law, which would vest in the utilities commission full control of the utilities of the State with the provisions of now general acceptance.

Election of Officers

The association passed a resolution to change its name to the Kansas Public Service Association and to create the office of a permanent secretary, with a salary and with offices in Topeka. There were about 150 in attendance at the convention, practically all of whom were electrical men. The papers were all of an electrical nature.

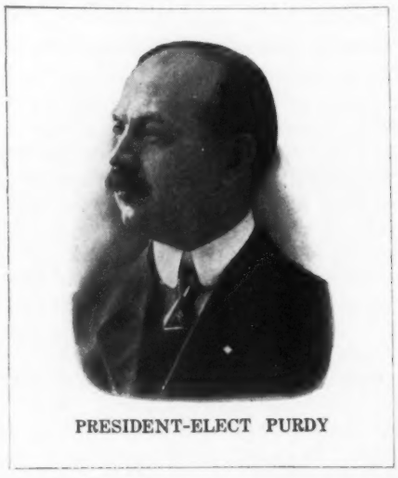
Officers were elected for the ensuing year as follows: President, A. H. Purdy, Topeka Edison Company; first vice-president, W. R. Wagoner, Salina Light, Power & Gas Company; second vice-president, L. G. La Fite, Eureka Electric & Ice Company; third vice-president, W. J. Welfelt, Winfield Municipal Water, Light & Power Plant; secretary, E. A. Wright, Manhattan Ice, Light & Power Company, to hold office until permanent secretary is elected; treasurer, J. D. Nicholson, Kansas Gas & Electric Company, Newton. The following members were elected to the executive committee: A. M. Patton, Topeka; L. O. Ripley, Wichita; C. L. Brown, Abilene; L. K. Green, Concordia; M. T. Flynn, Kansas City.

A. H. Purdy, the new president, is general superintendent of the Topeka Edison Company, with which he has been associated ever since he was sixteen years old. He was made secretary and assistant treasurer of the company in 1905 and promoted to the office of general superintendent in 1910.

In addition to the discussion of subjects largely of local interest, the following papers were read: "Is Red Tape Good Business Insulation?" by L. O. Ripley of Wichita; "The Diesel Engine," by Rudolph Schlatter of St. Louis; "Concentric Wiring," by W. L. Gardner of Topeka; "Transformers and Lightning Arresters," by H. F. McRell of St. Louis; "Steam-Flow Meters," by L. E. Northshield of St. Louis; "Merchandising, Past and Present, from a Central-Station Standpoint," by B. J. Long of Topeka; "Excess Indicators," by C. L. Wells of Kansas City; "Electric Drive for Flour Mills," by Charles A. Stanley of Wichita; "Central-Station Power for Irrigation Pumping," by C. A. Fees of Wichita; "A New Utility Law for Kansas," by Prof. George C. Shaad of Lawrence; "Selling Electric Advertising in Small Cities," by B. E. Jacks of Salina; "Standards in the Utility Plant's Boiler Room," by Dean P. F. Walker of Lawrence; "Electrical Refrigeration," by C. J. Carlson of Chicago.

Concentric Wiring Discussed

In his paper Mr. Gardner referred to the work which is being done by the electrical committee of the National Fire Protection Association in conjunction with representatives of other electrical associations, and quoted a portion of the last report of that committee in which rules were suggested as a basis of experiment in perfecting a system of grounded concentric wiring. He said that, in a recent article in the ELECTRICAL WORLD ("First Installation of Bare Concentric Wiring in America," Oct. 9), the author admits the necessity for special fittings and recognizes the danger of running the wire close enough to the floor of a dwelling to be



PRESIDENT-ELECT PURDY

reached by broom handles, chairs or other domestic equipment which might damage or displace it. The suggestion was made also that wire be run under baseboards. Mr. Gardner believed this suggestion would never be considered for a moment by any man who is interested in safe standards of construction. While the concentric-wiring system has been used to some extent in foreign countries, it must be remembered, the speaker said, that over there building construction is vitally different from here, as practically every building in Europe has walls of brick or stone, instead of the almost universal wood walls which obtain in the dwellings of the United States. He intimated that insurance interests have gone to large expense to assist in the development of safe systems of electric lighting in this country, and while they will welcome any plan which will help in the growth and improvement of the electrical industry, at the same time they feel that they may rightfully join in the powerful slogan which now rules the conduct of every American industry, "Safety first."

Electric Operation of Flour Mills

Mr. Stanley in his paper pointed out three prominent reasons why the flour mill should be operated by elec-

tric drive and went into considerable detail to substantiate his reasons. The first reason is that the cost of operation is no more, and in most cases is less, than that of any other kind of power. This depends to a marked degree upon the rate per kilowatt-hour which the central station is able to make, depending largely upon the size and efficiency of the plant. The second reason is that the cost of the electric motors and of their installation is about one-third the cost of steam, oil or gas engines, while the floor space required by the isolated plant is from ten to twenty times that required by electric motors. The third reason is the elimination of engine and boiler troubles with their omnipresent repair expenses.

On the evening of Oct. 22 the Jovian Order held a rejuvenation at which fifteen candidates were initiated.

National Association of Railway Commissioners in Convention at San Francisco

The twenty-seventh annual convention of the National Association of Railway Commissioners was held in the Municipal Auditorium at San Francisco, Oct. 12 to 16 inclusive. Delegates from a large number of public utility bodies in the United States and Canada were present, representing the twenty-three railroad commissions, eight public utility commissions, twelve public service commissions, three corporation commissions and one gas and electric light commission which the association membership includes.

Reports were presented on the following subjects: Executive committee; amendment of act to regulate commerce; car-service demurrage; reciprocal demurrage; storage rules and charges; express service and express rates; grade crossings and trespassing on railroads; legislation; powers, duties and work of railroad commissioners; railroad taxes and plans for ascertaining fair value of railroad properties; rates and rate-making; railway capitalization; railway service and railway accommodations; safety appliances; statistics and accounts; shippers' claims; statistics and accounts of electric railways; telephone and telegraph rates and service; uniform classification and simplification of tariff issues; rails and equipment; physical valuation; revision of annual reports; railway accident reports; subdivision of accounts.

Commission Development in Five-Minute Speeches

A feature of the convention was the forty-five minutes at the beginning of each day's session devoted to the presentation of five-minute speeches by representatives from various commissions. In this brief time each speaker was expected to bring out the most important development of the year relative to commission work in the particular State represented. In accordance with the custom, a review of methods and principles was presented rather than an account of accomplishments, and keen interest was manifest in many of the subjects thus briefly presented. The remainder of each session was devoted to the consideration of committee reports and the discussion that followed.

Committee reports and recommendations on service and rates and finance of railroads and other public utilities occupied a considerable portion of the sessions. The report on reciprocal demurrage, presented at the first day's session by the committee of which W. H. Stutsman, North Dakota, was chairman, precipitated a lively debate. The association went on record against advocacy of penalties for roads when they failed to provide cars. F. C. Niles of New Hampshire presented a report advocating the elimination of all railroad grade crossings.

Edwin O. Edgerton, California Commission, pointed out that practically every application to the commission of any importance involved a complete consideration of the finances of the company. Over $466,000,000 of stocks and bonds had been authorized by the California Commission, he said, and of this sum $248,000,000 was for new ventures. The California Commission works with the Interstate Commerce Commission in its national valuation of railroads, and as a result the State is relieved from further expense in railroad valuations, except on State lines, at the same time that it has the advantage of all the information possessed by the Interstate Commerce Commission. The California Commission has established valuations for 1100 miles of railroad at a total reproduction cost of $61,000,000.

At a banquet tendered the association by the Railroad Commission of California on Oct. 13 about 750 delegates and guests were present to hear the speakers. Max Thelen, president of the Railroad Commission of California, in acting as toastmaster, pointed out that the regulation of public utilities existed in England as long ago as the sixteenth century, when far more services were regulated than are covered by even the most far-reaching laws of modern times.

Clifford Thorne of the Iowa Railroad Commission, president of the association, spoke briefly on the topic, "Is Regulation Worth While?" Theodore N. Vail, president of the American Telephone & Telegraph Company, gave an address on "Some Observations on Modern Tendencies." Samuel Insull, president of the Commonwealth Edison Company, Chicago, read an address on "Economic Significance of the Supply of Electricity," in which he pleaded for co-operation between the regulatory power and the public utilities to the end that the best service might be rendered at the lowest rating commensurate with a fair return on the investment.

The "Reproduction-Cost" Theory

The committee on plans for ascertaining fair valuation of railroad property dwelt on what was termed the "danger of reproduction-cost theory." In the proceedings before the Interstate Commerce Commission, under the authority of the federal valuation act, and since that time, the committee stated, railroads have bent every effort to the establishment of the reproduction-cost theory of valuation, to the exclusion as far as possible of every other element of value. The committee reporting to the convention declared that the reproduction cost of a utility is not necessarily the value of the property, but is only one of the elements entering into its value. The comment of the committee was in part as follows:

"Without at this time going further into the question of the relative weight to be given, fairly and equitably, to the different elements of utility value specified by the Supreme Court and referred to in the valuation act, we desire simply to point out that the overshadowing importance sought to be given by the carriers to the reproduction-cost theory is not supported by the decisions of the Supreme Court and is not in harmony with the language or the spirit of the federal valuation act, and that if the carriers are successful in their campaign the result will inevitably be, sooner or later, a general increase in rates."

In the election of officers, Judge Robert R. Prentice, chairman of the Virginia Corporation Commission, was chosen president of the association, and Max Thelen was made first vice-president. E. C. Mills, New Hampshire State Commission, was elected second vice-president, and William M. Connolly, chief clerk of the division of valuation, Interstate Commerce Commission, was re-elected secretary of the association. Washington, D. C., was chosen for the next annual convention, which will meet Nov. 14, 1916.

Training Men for the Central-Station Industry

How the Commonwealth Edison Company of Chicago Prepares Men for Public Service Work—Practical Education of Commercial Recruits

A MODEST suite of rooms in the Edison Building, Chicago, is the headquarters of an educational movement which has far-reaching possibilities for the central-station industry. The movement itself is confined so closely within the properties of which Samuel Insull is the head that little is heard of it outside. Yet no secrecy is maintained about either its purpose or its method and actual details of operation, and it arouses no general public interest. By the outsider it would be regarded—if he were sufficiently concerned to inquire about it at all—as an agency through which the companies, first, provide education for employees who are anxious to learn, and, second, interest promising young men in their service. To the observer who considers the trend of affairs within the industry as a whole it is an enterprise founded on a sound and extremely practical business basis. It improves the existing personnel and enlists picked men for the future. In so doing it deals experimentally, yet effectively, with serious problems of public policy. It gives men a better understanding of the business and encourages them to more thorough education by all means at their command. It furnishes men who are much wanted to take up the highly complex questions of commercial development.

Legally the Chicago Central Station Institute is an incorporated institution standing on its own feet. Actually it is controlled by four companies in which Mr. Insull is the dominating element—the Commonwealth Edison Company, the Federal Sign System (Electric), the Middle West Utilities Company, and the Public Service Company of Northern Illinois. Ostensibly it is conducted like other corporations organized for logical business reasons, for the profit which justifies ordinary capital investment and the regular expenditure of labor; but in reality its operations yield a steady and irrecoverable deficit because the expense per student is several times greater than the amount each student pays. Study in the institute is not required of employees of the companies; it is simply an opportunity that is open to them if they want to take it. But no one is eligible to be a student in the institute unless he is first in the employ of one of the companies. The opportunity is one that goes with the employment.

Two independent lines of development are followed in this educational movement. Either one is important enough to require an organization to carry it out. Both have the common object of making men abler for service with the companies or elsewhere in the central-station industry.

But the two aims are kept separate because they deal with different types of men and seek to accomplish different objects. One deals with men already in the serv-

COMPANY EMPLOYEES ATTENDING CLASSROOM LECTURE AT THE CHICAGO CENTRAL-STATION INSTITUTE

ice, the other is for selected college graduates just beginning their work.

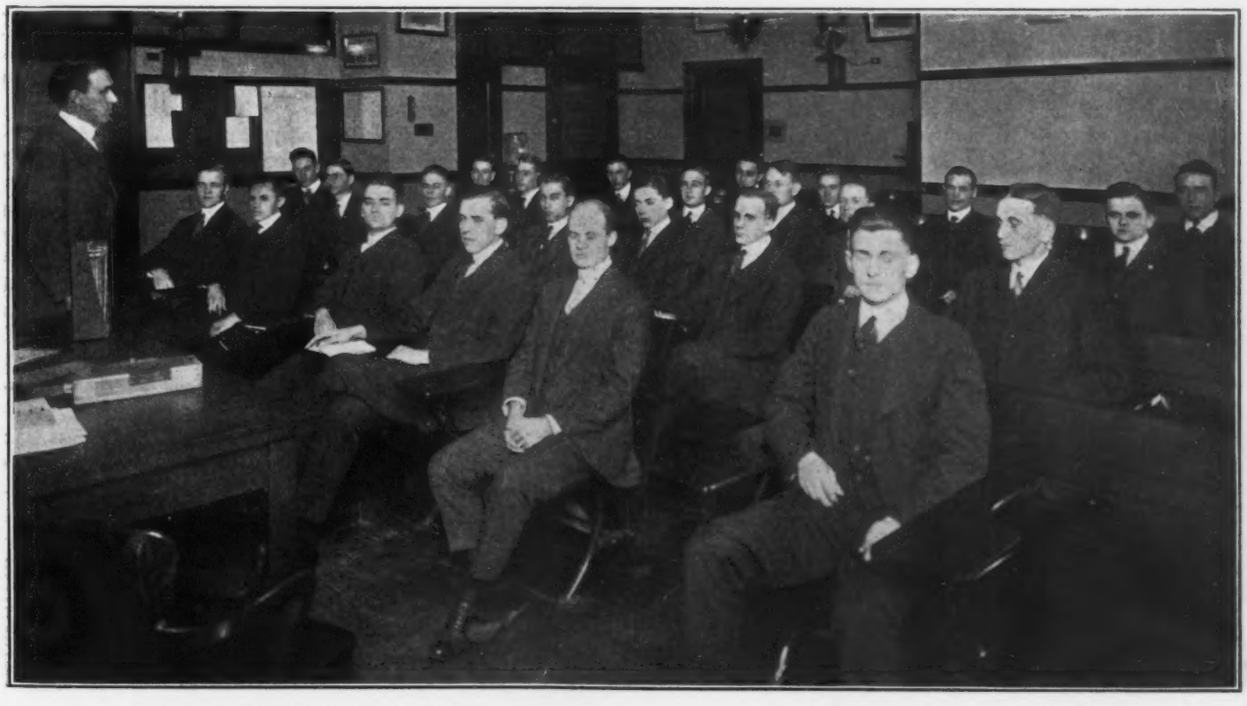
Classes for Employees During Company Working Hours

One of these lines of activity is really a form of welfare work. It is for men who want to increase their knowledge of matters electrical. To such individuals it offers afternoon classes, instruction and examination with a certificate upon graduation. It is not wholly elemental, however, in scope. To be sure, one of the courses thus opened deals with the simpler facts of electricity and magnetism. But for those who can show that they have a fair groundwork of knowledge of the elementals more advanced instruction is open; and the men like to study the theory of operating and engineering matters as well as that of commercial engineering. They receive every encouragement to enter the classes, but they are themselves required to meet the tuition fees which are charged, not as representing the cost, but as an evidence that the transaction is a business one. The companies let the men leave their work at the necessary hour to enable them to reach the classroom at 4 p. m., so that they make a direct contribution in time in addition to their large outlay toward the expenses of the institute. The fact that the institute is conducting the classes for active employees in afternoon hours instead of in the evening this year carries a suggestion for other central-station companies that may plan instruction courses of this character. It was found that after working all day men were too tired to take up the required studies at night and do full justice to them. Since maximum benefits were apparently impossible under that plan it was decided to try another method. The offer of educational advantages of this kind to 5000 miscellaneous working employees of a large American corporation is no longer an experiment. From 125 to 150 men annually say that they would like to take a course. That means individuals from all departments, office, construction, operating—clerks and workingmen—representatives of the varied nationalities or offspring that are found inevitably in so large a number of people here. It means men of differing degrees of education, mentality, individual character, age, ambition. From the total 100 to 125 are selected as likely to receive maximum help from the instruction. That these men put themselves in the way of learning more does not mean that they know less than their associated employees. It may mean that, knowing more, they appreciate to the full the advantage of as much information as they can get concerning their work. Observation and the records show that some of the men who devoted one year to the elemental class applied in ensuing years for admission to a more advanced course. Thus they form studious habits and they lessen the chances against them in competition with those who have had more education.

Men and Company in Closer Touch

No one who discussed the subject with the representative of the ELECTRICAL WORLD expressed any illusions concerning the application of the educational movement to all classes of men in the service who want to undertake it. It is recognized frankly as a movement involving expense both to the company and the men, although several times as much to the former as to the latter. It brings company and men into closer touch. It reveals to the men a deeper interest in them on the part of the company. It fits them better for service either with that company or with another similar company. It broadens their vision, particularly through the systematic scheme of lectures that is a prominent feature of the courses. And it gives the company a new sidelight on the personal characteristics of its rank and file.

The most unusual feature of the Chicago Central Station Institute is its work for and with college graduates. An electrical-engineering student in a college away from Chicago is surprised when he is addressed on the subject of his life work with a question as to his interest in central-station employment. Yet in doing this, as it has done systematically in some of the colleges during the several years of its existence, the institute is only following the practice of the larger electrical manufacturing companies as well as of manufacturing companies in other industries. Its student course is directly comparable and competitive with those of the large electrical manufacturers, yet it offers a smaller initial re-



A CLASS OF TECHNICAL GRADUATES LISTENING TO A LECTURE ON STORAGE-BATTERY CONSTRUCTION

muneration than they do. There is no haphazard selection of men for the graduate student course. The preliminary talks often follow direct suggestions from professors of electrical engineering concerning available or desirable candidates. They mean a frank statement in reference to the purposes of the institute in selecting men. An equally frank response is asked in regard to the inclinations of the student. This is not all that is done to restrict the students as closely as possible to those who are likely to meet the favor and needs of the heads of departments of the companies interested. The talks lead the students into discussions of other subjects, remote from the immediate topic in hand but illuminating as revealing their individualities.

Studying the Candidates for Admission

Far more attention is given to these men than is devoted to the usual applicants for employment. Since they have a better starting basis in education they are regarded as likely candidates for promotion if they possess or develop correspondingly in other requisites for more responsible positions. They are therefore asked about their views on public questions which affect the interests of the companies. Their personal characteristics receive very careful consideration from the examiners. Another precaution which has been found to be wise is brief correspondence with several whose names are offered by the student as recommendations. In these letters the institute points out that the student will take the place at a sacrifice and willingly test his qualifications in the expectation of a good permanent opening. Under these conditions, as the letters show, it would be unfair to let the student devote his time to the task unless he had the particular qualities that would be likely to bring him success in this vocation. Every effort is made to avoid the waste of time of either the individual or the company.

Terms of the Apprenticeship Course

The financial proposition made to the student is that during the year of the apprentice course he shall receive $40 per month. Out of this he pays $100 to the institute for the year's course. Roughly, one-half of his time is spent in the classroom, one-half in departmental work. Each supplements the other, and it would be difficult to decide which is the more valuable preparation. In the classroom he receives instruction on practical business and public-policy matters connected with the industry. Questions are encouraged because it is desired to make all the points of instruction perfectly clear. This, however, is only the beginning of the work there. He makes notes, which are examined and to which a marking is given in order to measure his scholarship and powers of observation. At stated periods he discusses some appropriate topic before his fellow-students, so that his ability to talk on his feet may be tested and improved. He sees demonstrations of sales and criticises the arguments and questions of both buyer and seller. At times he becomes a buyer or seller before the classroom. These experiences are given to quicken his thought and responses and polish his manner of approaching a prospective customer. He hears occasionally lectures or talks by visitors or men prominent in the company or industry, and these widen his viewpoint. He has to undergo a marking by fellow students. This is done to develop the faculty of appraising the worth of men.

When the morning class work is over the student goes to his place in some department of the various companies. Practical as the instruction is, the afternoon employment is more practical. The afternoon work for the year is so planned as to give the student as much acquaintance as possible with the various departments, particularly the different branches of commercial work. As one of the main foundation ideas of the institute is to develop men to take up the rapidly increasing possibilities of commercial expansion, more time is given to work in the commercial department than to that in any other. There are ten or twelve possible places of assignment. The student may spend one month in each one, but he is sure to give about four months to as many different features of commercial work. They all test his aptitude for the work and his liking for it. Within the limits of central-station activity there is scarcely any kind of task that may not be given him to do under the personal direction of a regular employee. While he is doing this he is undergoing the same critical examination and weighing that is conducted in the classroom. Regular reports are made to the institute both by him and about him. Most important of all, each student is being considered carefully by every head of a department. For at the end of the year the head of a department notifies the institute that he would like to have certain of the students permanently. Sometimes the same students are wanted by two or more departments. Occasionally it has happened that one was not wanted by any department. Generally, however, the experimental period results in fitting the man into the needed place.

Interesting Men in Commercial Work

With actual experience in the commercial department students gain interest in that work. Many start with the idea that they want to be in the construction or operating departments. They want to follow technical development. But as the companies have a definite need for commercial men the trend of the departmental work has been directed toward commercial activities with results that have been satisfactory. At the same time the final assignments of men are not made without regard for their personal preferences.

After the students pass from the institute to regular service in the company the institute records follow them. Since the establishment of the movement about 100 college graduates have gone through the training and are now in the companies. Some have done remarkably well in this short time and are in positions of responsibility. Others, a small minority only, have not done so favorably as the mark of expectation of the companies. But the attainments as a whole are regarded as an adequate return, or, of course, the work would not have been continued.

The idea which was mainly responsible for the creation of the Chicago Central Station Institute was a commercial one. Commercial development and prospects increased faster than men available for the work. It was concluded to establish an agency through which college graduates will become familiar with the commercial department in its important relation to the prosperity of the company. From this the present plan was evolved to carry out not only the original idea but also an enlargement whose broad scope is outlined above. One of the questions on which great problems rest is: How shall comprehensive training be assured to promote the making of men for the future? The Chicago movement makes the answer clearer.

A second article on the work of the Chicago Central Station Institute, to be presented later, will discuss in more detail the instructional courses and methods of the institution.

Building a Power Station Upon One in Service

Steam-Engine-Driven Generators Retained—An Ingenious Condensing Equipment Installed, and Station Arranged for Efficient Operation

A COMPLETELY remodeled steam-electric station now stands at the corner of Power and Warder Streets in Springfield, Ohio, that has been built, without interfering with service, around and within an old plant occupying the same site. This station furnishes energy for the electric-railway system of the Springfield (Ohio) Railway Company, a subsidiary of the American Railways of Philadelphia, Pa. Much of the equipment still serviceable from the old station has been used in the new one, including reciprocating steam engines. The installation of these units was also influenced by the fact that the American Railways had on hand two excellent engines replaced by steam turbines in other stations. Arrangements have been made, however, for installing turbo-generators later.

The Boiler-Room Equipment

The boiler room contains a total equipment of 2100 boiler-hp. of Stirling-type water-tube boilers. There are six units, four of 400-hp. rating each and one each of 300-hp. and 200-hp. rating. All boilers are equipped with Murphy stokers with both electric and steam drive. Beneath the stokers is a track for ash cars, forming part of a complete ash-handling equipment. Over this aisle is a suspended steel bunker of 300 tons rating, carrying below it a weighing larry from which the coal is spouted to the stokers.

Draft for the furnaces is provided by means of a brick chimney 8 ft. in diameter at the top and 150 ft. high and a steam-driven, induced-draft fan. As shown in the general plan, there are three outlets from the main smoke flue, one through an economizer chamber and the fan, one direct through the fan, and the third through a by-pass. The economizer is of the Green type and is rated at 2000 hp.

Stack, fan house and economizer are out of doors. The boiler-room auxiliaries include an open-type Cochrane feed-water heater of 2000-hp. rating, Warren vertical marine-type feed pumps of 350-gal.-per-minute rating each, and a water softener. Treatment of water is necessary because hard water from the wells is used containing 24 grains of incrusting solids per gallon, which caused much trouble in the old plant.

Engine-Room Equipment

Four engine units of a total rating of 1975 kw. are installed. Two McIntosh & Seymour tandem-compound condensing engines drive General Electric generators, one a 450-kw. unit and the other a 500-kw. unit; another similar 500-kw. engine is coupled to a Crocker-Wheeler generator. The fourth unit is a 525-kw. Allis-Chalmers Corliss engine coupled to a General Electric generator. The engines exhaust into one exhaust main which at one end connects with two Kuylenstjerna barometric surface condensers. These will be described later. Before reaching the condensers the steam passes through a Sweets oil separator, which removes 99 per cent of the oil present. This main exhaust line is also provided with automatic exhaust valves in each end so that, if necessary, some of the units can be run non-condensing when the others are connected with the condenser.

Two condenser circulating pumps in the engine-room basement draw water from ten 35-ft. driven wells near the power house. There is also a connection to a nearby creek. Two steam-driven, reciprocating vacuum pumps for the condenser are installed on the engine-room floor.

The generator output is controlled through a standard General Electric switchboard containing four generator, one lighting, one totalizing and six feeder panels,

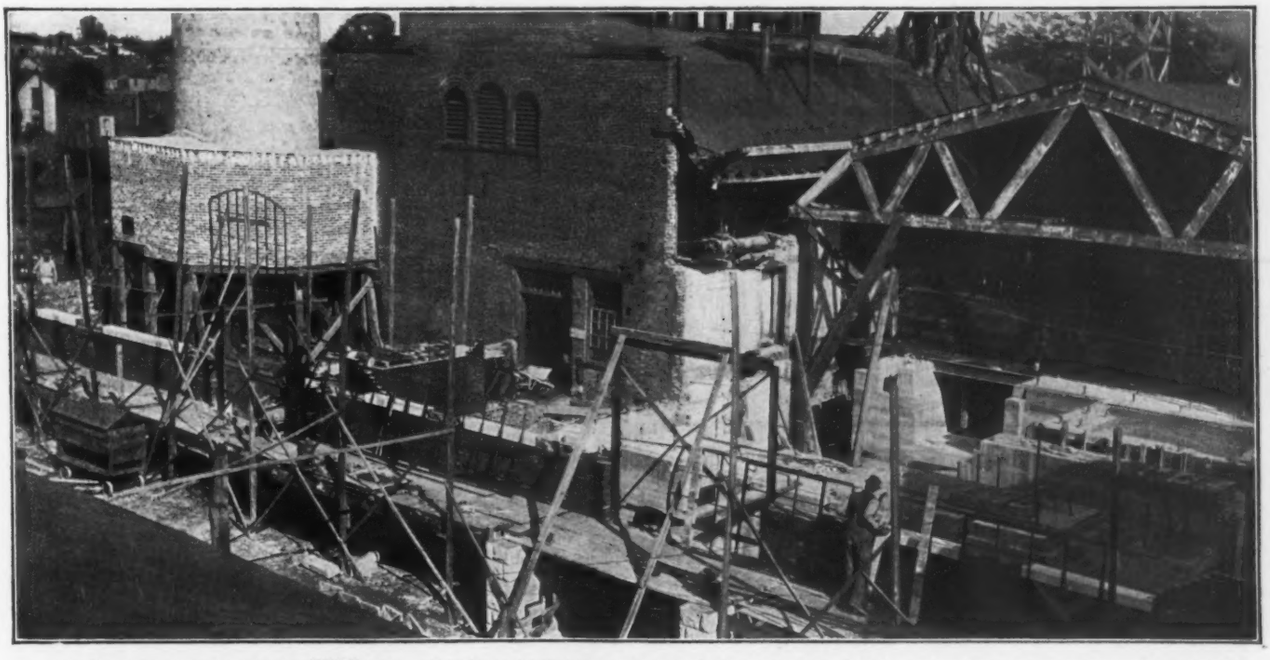


FIG. 1—BUILDING A NEW 2000-KW. STATION AROUND AND WITHIN AN OLD ONE IN SERVICE AT SPRINGFIELD, OHIO

The walls for the new station and the entrance to the future engine room are shown in the foreground. At the right foundations for new machinery are being placed while apparatus in the old engine room behind the temporary partition is still in service. At the left a temporary by-pass to the chimney is shown, and near the center of the picture is seen the live steam header shored up while the building walls are being demolished.

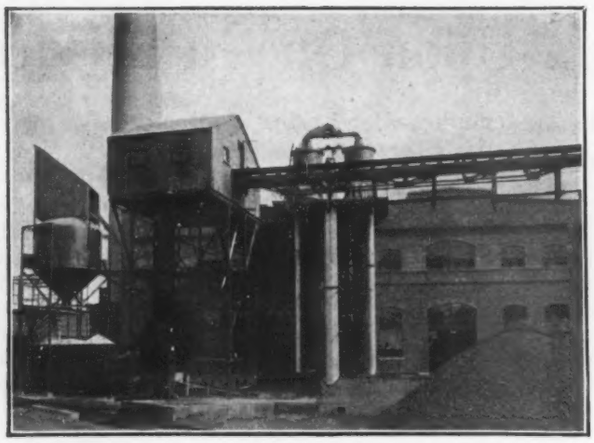


FIG. 2—CONDENSER, CONVEYOR HOUSE AND ASH BIN

FIG. 4—COAL CONVEYOR AND STORING APPARATUS

with ample room for expansion. The outgoing feeders are supported inside the station on a steel cable rack mounted on the building wall. Outside they are carried upon angle-iron poles 40 ft. above ground.

Coal is delivered in railroad cars and dumped into a steel track hopper, from which it falls upon an apron feeder and is delivered on a two-roll crusher. The crushed coal is distributed on the storage pile by a V-bucket conveyor. For direct filling of the boiler-room bunker a cross-conveyor is provided connecting with the upper run of the storage-pile conveyor. The horizontal run of the latter is carried on a trestle, the return run being through a concrete tunnel. Coal to be reclaimed from storage is admitted to the conveyor through gates. A tower near the yard and boiler-room conveyors contains all the driving machinery.

The storage space has a capacity of 3000 tons of crushed coal. The experience of the American Railways with storage of crushed coal has indicated that an undue fire risk is not incurred thereby, while this practice permits the use of simple machinery, cheap to install and easy to operate.

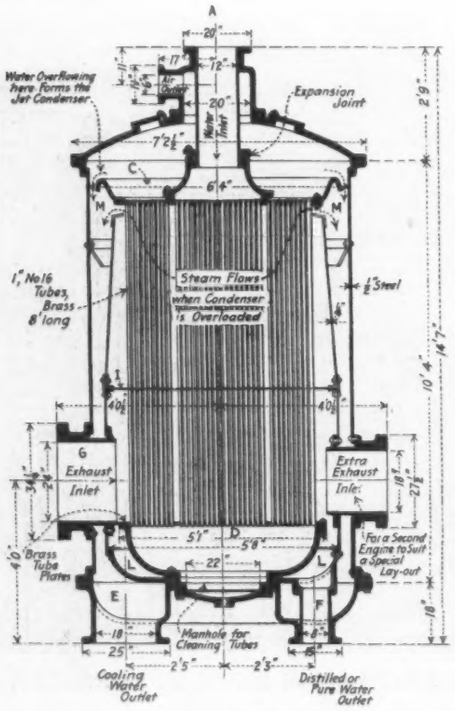


FIG. 3—SECTION THROUGH CONDENSER, SHOWING OPERATING FEATURES

The ashes are handled entirely separate from the coal, so that the two equipments may be operated according to their respective requirements. Ashes are collected in pits under the stokers, from which they are drawn into a push-car. This car has roller bearings and its capacity is such that when fully loaded it can be easily pushed by one man. The car dumps into a skip hoist installed at one end of the building, the skip bucket having a capacity 10 per cent greater than the car and a width 1 ft. greater to prevent spilling of the ashes during the process of filling.

Surface-Jet Condensers

The condensers are mounted upon a steel tower outside the building with a hot-well below. The hot-well is in two compartments, one for the circulating water and one for the condensate. The compartment which holds the condensate is equipped with an oil filter bed intended to remove any trace of oil still remaining in the water coming from the condensers.

The condenser itself, the invention of Adolph Kuylenstjerna, mechanical engineer for the American Railways, is of the surface type, combining an auxiliary jet-condenser feature. As shown in the accompanying section, the circulating water enters at the top of the condenser, passes downward through the central group of tubes and upward through the outside ring of tubes into the trough *C*. Flowing over the lip of the trough, it forms a thin tube, finally leaving by the outlet *E* through the tail pipe to the hot-well below.

The exhaust steam enters at *G* and impinges on the tubes, being forced between the tubes by a baffle ring *I*. Any steam remaining uncondensed flows through the opening *M* into the outer space in the shell and there comes into contact with the falling sheet of circulating water and is condensed. The steam condensed on the tubes falls into the chamber *L* and thence flows out through outlet nozzle *F* into the tail pipe and to a separate hot-well.

Air is pumped out of the condenser at the nozzle *B*, close to the cooling-water inlet. This arrangement was adopted to secure the reduction in volume of the outgoing air which accompanies the lowering of its temperature. Otherwise an extra air cooler would have been necessary.

The jet-condenser feature provides for peak loads, permitting the capacity to be figured for average load. There is no need for a wet vacuum pump as the barometric feature takes care of the condensate. The arrangement provides for easy cleaning and draining. The surface-condenser feature provides for freedom from scale, and yet many of the jet-condenser features are retained. The tube surface in the condenser is

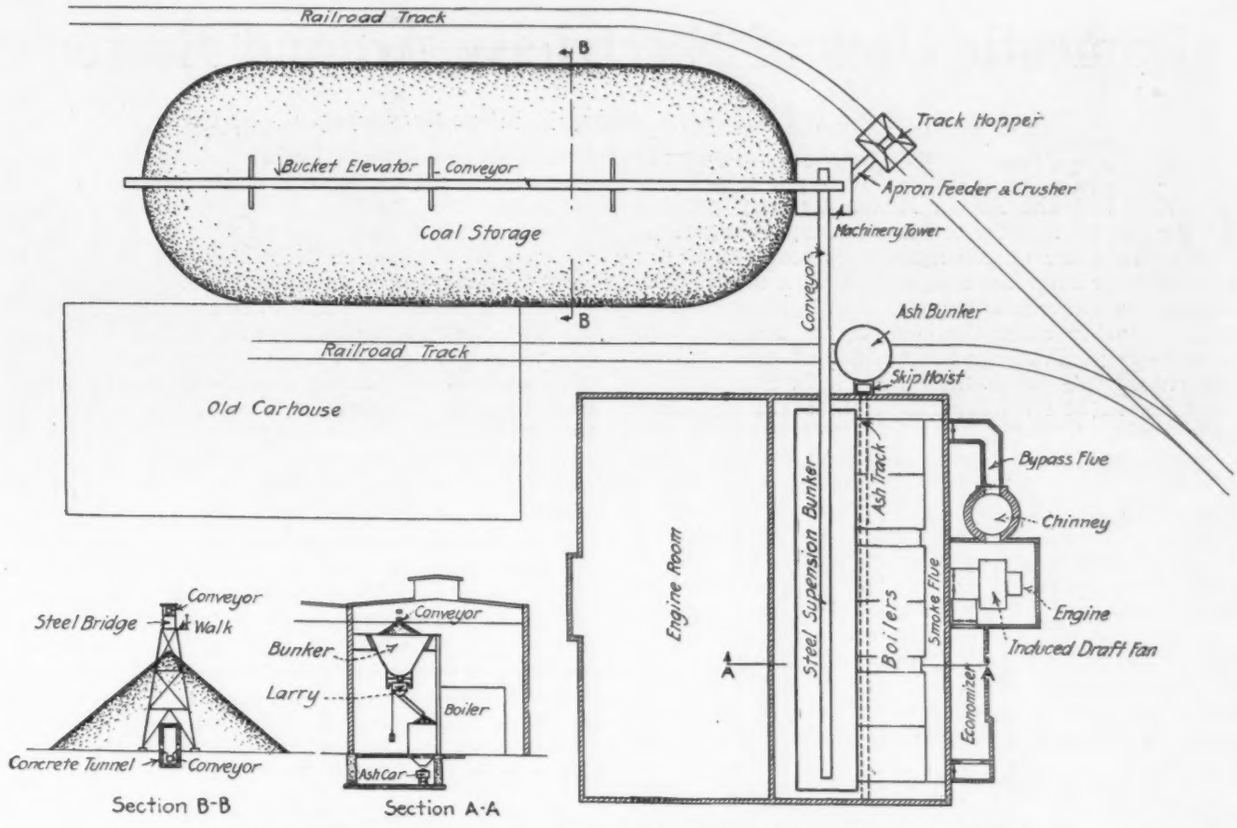


FIG. 5—LAYOUT OF STATION AND EQUIPMENT FOR HANDLING COAL AND ASHES

about 2000 sq. ft., which at the nominal rating indicates an output of 2000 hp. It has handled as high as 3000 hp. at times.

As stated above, the hot-well has two compartments, one for the circulating water and one for the condensate. They are side by side and both deep enough to seal thoroughly the condenser tail pipes immersed in them. Between the two chambers is an outside pipe connection with a swing check valve permitting make-up water to flow into the condensate chamber when the level falls sufficiently.

The power-plant work has been carried out under the direction of the American Railways Company, of which H. J. Crowley is general manager and A. Kuylenstjerna mechanical engineer. Andrew Schmittauer, superintendent of construction, was in charge of construction work. The property is managed by George C. Towle, general manager of the People's Railway, Dayton, Ohio.

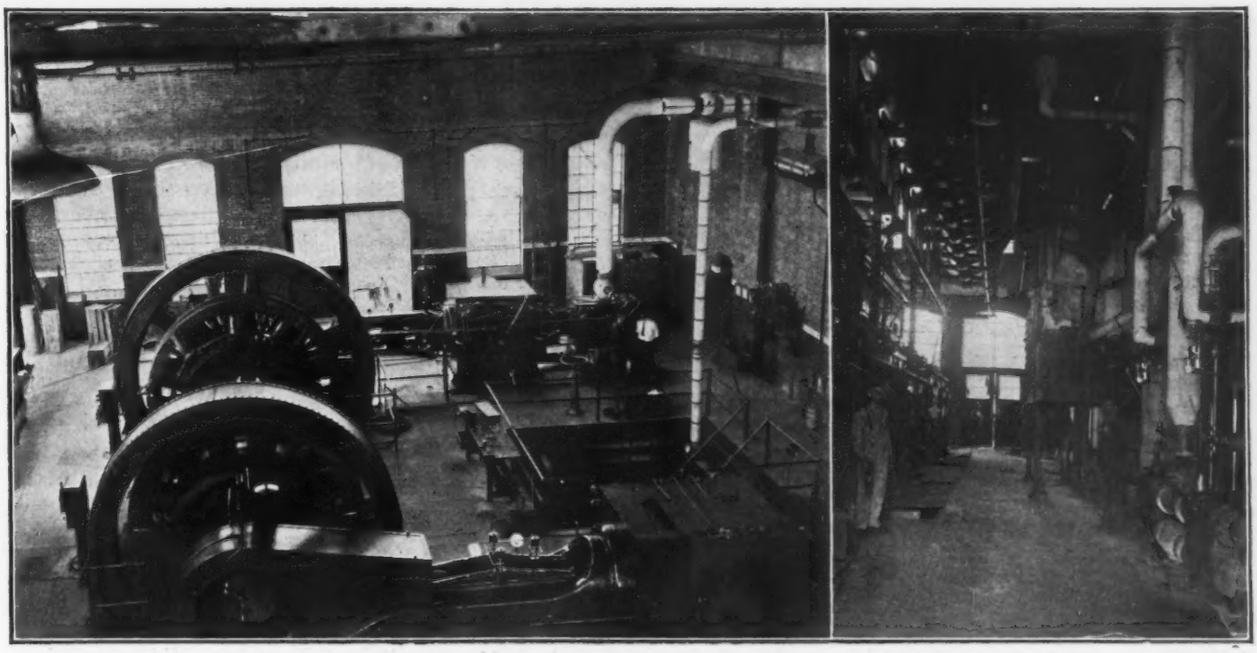


FIG. 6—RECIPROCATING-ENGINE-DRIVEN GENERATORS AND BOILER ROOM IN NEW STATION AT SPRINGFIELD, OHIO

Domestic Uses of Electricity Around Boston

Two-Cent Rate Now Available for Cooking, Heating, Refrigeration and Other Household Applications—To Standardize Installation Costs

On Oct. 1 the Boston Edison company put into effect a rate for cooking, heating, refrigeration and other miscellaneous purposes of 2 cents a kilowatt-hour after the first 10 kw.-hr. a month. The stimulus to domestic uses apart from lighting has been so great as to cause the company to inaugurate an electric-range division as a branch of the appliance department. Albert L. Smith, Jr., is in charge, under W. Graydon Stetson, superintendent of the appliance department.

Several apartment houses are about to be equipped for electric service throughout; that is, they will be provided with electric ranges as the sole means of cooking. An apartment house of sixteen suites on Beacon Street, Brookline, will have an electric range in each suite. Apartments in this building rent for about $3,000 per annum, there being eight or nine rooms to a suite. The ranges installed are S-3 General Electric cabinet type, designed to provide meals for as many as ten persons in the family and having three hot-plates, a cooker compartment, an 18-in. by 18-in. by 12-in. oven, and a food-warming closet of about the same size.

The ranges installed in a ten-suite apartment house which is situated on Mount Vernon Street, Boston, and consists of three-room and four-room suites, are the Westinghouse type 2-18, designed for small families preparing meals in kitchenettes.

Increase Expected as Result of 2-Cent Rate at Boston

The extent to which electric cooking has found favor in Boston territory, even under the less advantageous rates in force hitherto, may be inferred from the fact that more than 200 ranges of Simplex manufacture alone have been installed in Greater Boston. All are giving the fullest satisfaction, and now that the rate for the service is 33 1/3 per cent less than it was prior to Oct. 1, the electric range is bound to be more than ever popular in Boston Edison territory, with its population of more than 1,000,000.

There are probably 300 ranges in all in the territory served by that company, though there is no means of checking the number, as many are sold by jobbers and other dealers as well as through the Edison company's appliance department. In most instances the electric range is the only means of cooking in the home where it is installed, but occasionally it is auxiliary to a coal stove.

The Edison Electric Illuminating Company of Boston is negotiating with the electrical contractors in its territory with a view to obtaining standard, uniform prices for installing ranges under varying conditions. The appliance department has asked for bids on furnishing and installing three wires sufficient for a voltage drop of not more than 2 per cent at full load, which is assumed to be 5000 watts, and balanced on the company's 110-220-volt, three-wire system, with the necessary cut-out, pilot lamp and switch, leaving at the meter board the regulation three-wire meter loop and connecting the wiring with the range leads. One division of the estimate shows the price at which the contractor will do the work in BX construction, not to exceed 10 ft. in length, with excess price per foot above ten; another is for the work with 10 ft. in conduit; another in knob-and-tube construction, where permissible, not to exceed 10-ft. riser from the floor, in wooden molding; a fourth is the price for a three-wire service pipe complete, and the fifth division is for furnishing and installing the third wire in an existing service pipe.

With the contractor's figures in hand for the various localities, the company will be able to furnish its salesmen with a basis for quoting a price for an electric range completely installed, thus meeting the gas company's practice of connecting gas ranges. A deferred-payment feature of the range campaign is for the customer, if he desires, to pay for the range and cost of installing it in small monthly payments, the Edison company paying the contractor's bill.

Electric Cooking in Domestic-Science Classrooms

The use of electric stoves in connection with domestic-science departments of high schools in Greater Boston is coming to be general and augurs well for the future, in that school training with these appliances will accustom successive classes of young women to their use and make electricity the only cooking agency to be considered when they come to have households of their own.

Equipment for the domestic-science courses in the high school at Walpole, Mass., includes twenty-four single-disk stoves, one for each pupil's use, mounted on worktables with receptacles at hand for attachment. There are two portable electric ovens, and the practice is to plug in the oven in place of the stove when the pupil has finished with one operation and proceeds to the next. A large seven-unit range is provided for the demonstrator.

The kitchen of the dining hall at Wellesley College is equipped exclusively with Simplex ranges. In addition to all these self-advertising educational features, the Boston Edison company continues to operate two "houses of Edison light," at Arlington and at Natick, both of them permanent houses where electricity in all its various domestic functions is demonstrated to the public. The Arlington house is pictured opposite.

The use of the electric heater, of both the luminous radiator and the spring-coil, air-heater types, is fast increasing in Boston territory. These devices are commonly employed in heating bathrooms and chambers as well as offices, garages and other places where their cleanliness and ease of operation are appreciated. About 1000 radiators of several makes have been disbursed through the Edison company, and large numbers are sold by dealers. During 1914 the Edison company sold 488 Simplex radiators alone. This apparatus, as well as irons, table devices, percolators, toasters, etc., takes the 2-cent rate if connected to the heating-cooking circuit, or if the customer will go to the small expense of having a separate meter and circuit installed, which is often worth while, even if no range or other large unit is operated.

Eighty Electric-Cooking Services on Concord 3-Cent Rate

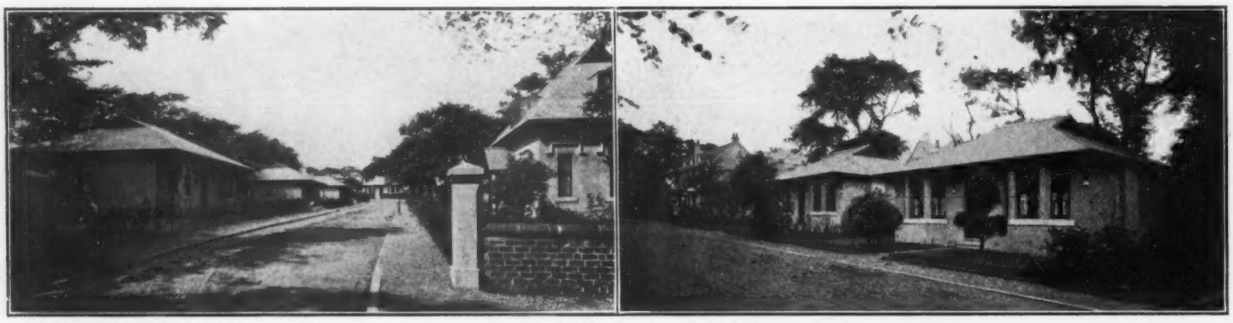
The municipal electric-light plant at Concord, Mass., was a pioneer in the introduction of electric cooking in New England. In 1907 the management established a 4-cent rate for this service, the net lighting rate at that time being 10 cents. There are now more than eighty cooking and heating services in the town, which has a population of about 6500. Two electric ranges are installed in the hospital building of the Middlesex School, a boys' preparatory institution; one range is in use in

Electricity in "The House of Edison Light"

In this comprehensive exhibit of household applications of electricity, arranged by the Edison Electric Illuminating Company of Boston, every possible convenience for the occupants, the housekeeper, the cook and the laundress has been installed. Kitchen, dining-room, bedrooms and bath all afford evidences of the universal usefulness of electricity and of its status as an indispensable factor in the modern ménage. Two permanent exhibits of this kind are operated by the Boston Edison company—one at Arlington and one at Natick.

a church vestry for the preparation of suppers and is found to be the "last word" in convenience and economy, and several homes have not only ranges for doing all the family cooking but also ovens, disk stoves, radiators, water heaters and other devices. The average bill for these combined services in Concord is about $27.50 a year, the rate now being 3 cents a kilowatt-hour, with a minimum monthly charge of 75 cents.

The manager, Albert W. Lee, found at one time that the use of electric irons on lighting circuits was resulting in bills which were out of proportion to the ability of the customers to pay for the service. He induced them to have separate services put in for their household devices, with the result that washerwomen are doing all their ironing with electricity at a cost no greater than for coal. The separate metering of energy for flatirons resulted in some cases in a 50 per cent reduction in quarterly bills.



A Chimneyless Electrical Suburb Near Glasgow, Scotland

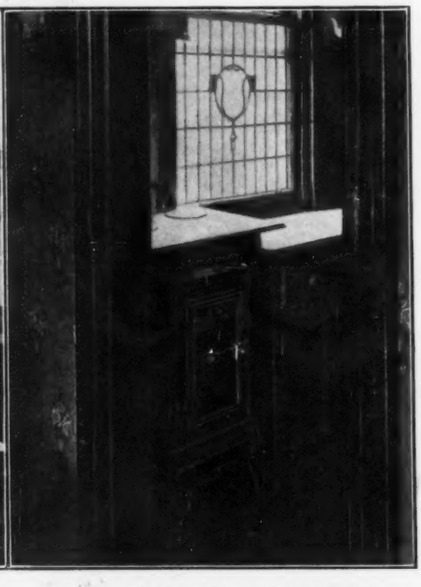
Attractive Settlement at Dumbreck in Which Electricity Is Used Throughout for Cooking and Heating, Simplifying the Servant Problem

BUNGALOWS without chimneys, completely equipped for electric heating, cooking and lighting, are features of a new "electrical garden suburb," as it is called, at Dumbreck, near Glasgow, Scotland. The houses of this interesting settlement are of four, five and six rooms, and are finished in stucco and roofed with asbestos tiling. These dwellings were designed particularly for all-electrical service, and the absence of chimneys adds, indeed, to the simplicity and symmetry of the architecture, as the illustrations herewith prove. From the point of view of the housekeeper, of course, the absence of chimneys and their accompanying soot, dirt and drafts assures greater cleanliness and healthfulness and eliminates the onerous labor attaching to the care of furnaces and stoves. With the houses completely equipped with electric labor-saving appliances, the problem of servants also loses many of its vexations, and the accompanying saving in wages is declared to more than compensate for the additional cost of electricity.

In the illustrations at the bottom of the page there are shown one of the bungalow kitchens, with its electric range, and one of the drawing-rooms, with its center lighting fixture and its electric "fire" or heater. Both the heaters and ranges are of Scotch manufacture, having been built by the Carron Company of Carron, Falkirk. The range is equipped with a separate switchboard which is mounted on the wall near by. Snap switches are provided for two hot-plates, the top and bottom heating elements in the oven, and a grill.

The electric heater or "fireplace" shown in the drawing-room measures 27 in. high and takes 2.5 kw.

A TYPICAL LIVING-ROOM WITH ITS ELECTRICAL "FIREPLACE"



THE ELECTRIC KITCHENETTE

"What to Call Alternating-Current Motors"

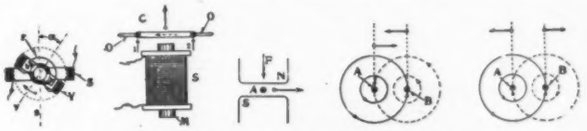
At the suggestion of the standards committee of the American Institute of Electrical Engineers, the ELECTRICAL WORLD opened its columns to present for the benefit of the entire industry the views of engineers and others on the classification of alternating-current commutating motors suggested in the papers of Val. A. Fynn and F. Creedy read at the annual convention of the Institute at Deer Park, Md., early in July. Comments from Prof. Elihu Thomson and E. F. W. Alexanderson were published in our Aug. 14 issue, together with an introductory communication by Prof. Comfort A. Adams, secretary of the A. I. E. E. standards committee. There are presented below the reply of Val. A. Fynn to the communications of Professor Thomson and Mr. Alexanderson, and also a communication from Dr. E. Rosenberg, formerly chief engineer of the British Westinghouse Company. It is hoped that as a result of the discussion a rational system of classification for alternating-current commutating motors and a scientifically descriptive nomenclature will be secured.

Mr. Fynn's Reply to Professor Thomson

Prof. Elihu Thomson's remarks, which appeared in the issue of the ELECTRICAL WORLD dated Aug. 14, 1915, indicate that in his view I have not done justice to his work. I am most anxious to assure him that I am quite an admirer of his and have no desire whatsoever to belittle any of his work, but I do feel that I am at liberty to disagree with him. In this instance I have ventured to criticise a theory and an expression evolved in 1887 or thereabouts, because in the light of knowledge obtained in part long after that date said theory and expression appear erroneous to me.

Professor Thomson accuses me of "misstatements of fact." His main charge is that, contrary to my statement, the term "repulsion motor" is not to be found in his U. S. patent No. 363,185. Strictly speaking, he is perhaps right, but I venture to quote Claim 5 of said patent:

"In an *alternating-current electric motor*, the combination of an alternating-current coil, a conductor of



FIGS. 48 TO 52 OF FYNN'S PAPER

metal of low specific resistance in which currents of high self-induction are developed, a commutator for governing the action of the apparatus *when in motion under the effects of repulsion* between the coil and field, as described, and a laminated or subdivided mass of iron enveloping the alternating coil, transversely to its circumferential axis."

After this I offer such apologies as the case demands.

I have chosen to neglect Figs. 12 to 17, inclusive, of the Thomson patent because they do not disclose anything which differs in principle from that shown in Fig. 8, which, except for the lettering, is the same as my Fig. 48. My paper deals with the classification of alternating-current motors and not with their design, so why should I go into constructional details?

I have stated on page 997 of my Institute paper as plainly as I know how that Ampère's "repulsion" and "attraction" are nothing but special cases of the basic electrodynamic action which is illustrated in my Fig. 50. I can, therefore, agree with Professor Thomson when he says that "repulsion straight away and deflection on an axis . . . are the same in essence." My point, however, is that since Ampère, who is surely entitled to as much respect as anyone, has chosen to describe the special cases illustrated in my Figs. 51 and 52 as "attraction" and "repulsion," these terms should not unjustifiably be extended sixty-seven years later to include the general case shown in my Fig. 50. True "repulsion" as defined by Ampère is, for instance, utilized in constant-current transformers and is absolutely independent of "phase relations of induced currents to other currents," to use Professor Thomson's rather vague expression. The reason is that the secondary or induced ampere turns are always equaled and opposed by corresponding primary ampere turns and these are the two relied upon for the repulsive action. The currents producing these two sets of ampere turns flow in parallel circuits and are always of same phase and opposite direction regardless of whether the secondary circuit is inductive or not. Note in this connection that when the circuits *S* and *Y* of Professor Thomson's motor, shown in my Fig. 48, *are* parallel, as called for by Ampère's rule, no motion results. I repeat, the Thomson motor does not operate by virtue of what is known as the repulsion effect. If the term "repulsion" is extended to include the case illustrated in my Fig. 50, then it becomes equally applicable to every direct-current or alternating-current motor ever made and might as well be abandoned.

My paper was written in the hope that it would be criticised, and I welcome criticism, being perfectly well aware that no one man can successfully evolve a classification such as I have attempted. Professor Thomson's suggestion as to my Figs. 7 and 19 appears to be a good one, and I am inclined to adopt it, substituting "windings" for "circuits." But in order to be consistent he ought, I think, to withdraw his criticism of Figs. 8 and 9.

I am not in the least concerned as to when the distinctions dwelt upon on the last two pages of my paper were first disclosed—I am merely discussing the operation of certain known alternating-current motors. Suggestions as to errors in that respect will be carefully considered, but I decline to be drawn into any priority discussions. Nor am I now interested in the total short-circuiting of the rotor referred to by Professor Thomson.

It would greatly interest me to have Professor Thomson outline the grouping he speaks of or propose a classification based on structure. I hope the standards committee will succeed in inducing him to give it the benefit of the ideas he evidently has on the subject.

That the names suggested by me are often lengthy and even cumbersome I am ready to admit, but I believe that this objection can be overcome with comparative ease provided we can agree that said names are correct or agree on changes which will make them so.

St. Louis, Mo. V. A. FYNN.

Mr. Alexanderson's Criticisms Answered by Mr. Fynn

If I understand Mr. Alexanderson's opening statement, he holds that the theory of alternating-current motors is extremely complex and cannot be simplified, also that because I have attempted to simplify it I have fallen into a number of errors. The suggestion

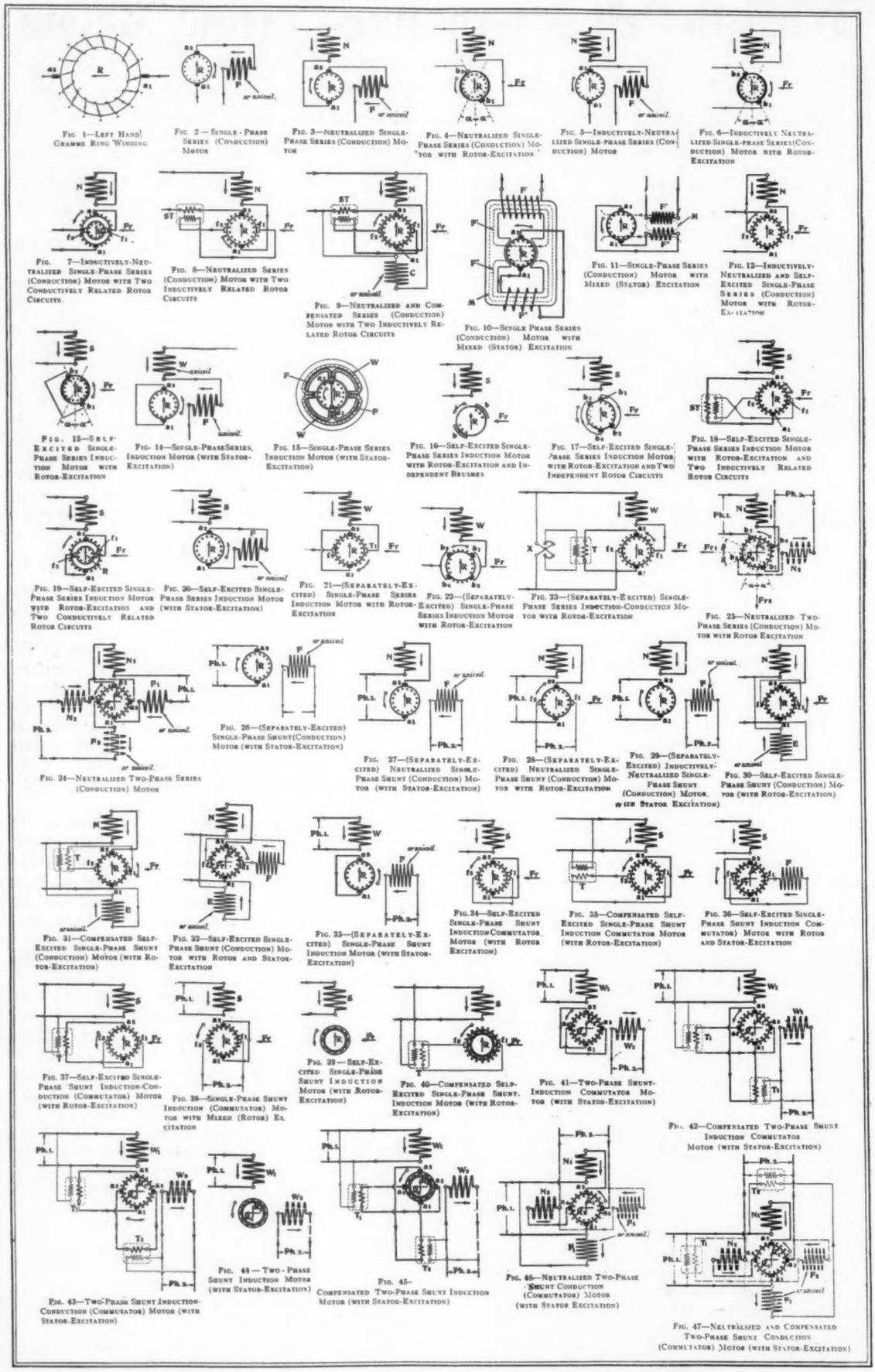


FIG. 1—LEFT HAND GRAMME RING WINDING

FIG. 2—SINGLE-PHASE SERIES (CONDUCTION) MOTOR

FIG. 3—NEUTRALIZED SINGLE-PHASE SERIES (CONDUCTION) MOTOR

FIG. 4—NEUTRALIZED SINGLE-PHASE SERIES (CONDUCTION) MOTOR WITH ROTOR-EXCITATION

FIG. 5—INDUCTIVELY-NEUTRALIZED SINGLE-PHASE SERIES (CONDUCTION) MOTOR

FIG. 6—INDUCTIVELY NEUTRALIZED SINGLE-PHASE SERIES (CONDUCTION) MOTOR WITH ROTOR-EXCITATION

FIG. 7—INDUCTIVELY-NEUTRALIZED SINGLE-PHASE SERIES (CONDUCTION) MOTOR WITH TWO CONDUCTIVELY RELATED ROTOR CIRCUITS

FIG. 8—NEUTRALIZED SERIES (CONDUCTION) MOTOR WITH TWO INDUCTIVELY RELATED ROTOR CIRCUITS

FIG. 9—NEUTRALIZED AND COMPENSATED SERIES (CONDUCTION) MOTOR WITH TWO INDUCTIVELY RELATED ROTOR CIRCUITS

FIG. 10—SINGLE PHASE SERIES (CONDUCTION) MOTOR WITH MIXED (STATOR) EXCITATION

FIG. 11—SINGLE-PHASE SERIES (CONDUCTION) MOTOR WITH MIXED (STATOR) EXCITATION

FIG. 12—INDUCTIVELY-NEUTRALIZED AND SELF-EXCITED SINGLE-PHASE SERIES (CONDUCTION) MOTOR WITH ROTOR-EXCITATION

FIG. 13—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION

FIG. 14—SINGLE-PHASE SERIES, INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 15—SINGLE-PHASE SERIES INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 16—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION AND INDEPENDENT BRUSHES

FIG. 17—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION AND TWO INDEPENDENT ROTOR CIRCUITS

FIG. 18—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION AND TWO INDUCTIVELY RELATED ROTOR CIRCUITS

FIG. 19—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION AND TWO CONDUCTIVELY RELATED ROTOR CIRCUITS

FIG. 20—SELF-EXCITED SINGLE-PHASE SERIES INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 21—(SEPARATELY-EXCITED) SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION

FIG. 22—(SEPARATELY-EXCITED) SINGLE-PHASE SERIES INDUCTION MOTOR WITH ROTOR-EXCITATION

FIG. 23—(SEPARATELY-EXCITED) SINGLE-PHASE SERIES INDUCTION-CONDUCTION MOTOR WITH ROTOR-EXCITATION

FIG. 25—NEUTRALIZED TWO-PHASE SERIES (CONDUCTION) MOTOR WITH ROTOR EXCITATION

FIG. 24—NEUTRALIZED TWO-PHASE SERIES (CONDUCTION) MOTOR

FIG. 26—(SEPARATELY-EXCITED) SINGLE-PHASE SHUNT (CONDUCTION) MOTOR (WITH STATOR-EXCITATION)

FIG. 27—(SEPARATELY-EXCITED) NEUTRALIZED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR (WITH STATOR-EXCITATION)

FIG. 28—(SEPARATELY-EXCITED) NEUTRALIZED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR WITH ROTOR-EXCITATION

FIG. 29—(SEPARATELY-EXCITED) INDUCTIVELY-NEUTRALIZED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR, WITH STATOR EXCITATION)

FIG. 30—SELF-EXCITED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR (WITH ROTOR-EXCITATION)

FIG. 31—COMPENSATED SELF-EXCITED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR (WITH ROTOR-EXCITATION)

FIG. 32—SELF-EXCITED SINGLE-PHASE SHUNT (CONDUCTION) MOTOR WITH ROTOR AND STATOR-EXCITATION

FIG. 33—(SEPARATELY-EXCITED) SINGLE-PHASE SHUNT INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 34—SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION COMMUTATOR MOTOR (WITH ROTOR EXCITATION)

FIG. 35—COMPENSATED SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION COMMUTATOR MOTOR (WITH ROTOR-EXCITATION)

FIG. 36—SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION COMMUTATOR) MOTOR WITH ROTOR AND STATOR-EXCITATION

FIG. 37—SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION-CONDUCTION (COMMUTATOR) MOTOR (WITH ROTOR-EXCITATION)

FIG. 38—SINGLE-PHASE SHUNT INDUCTION (COMMUTATOR) MOTOR WITH MIXED (ROTOR) EXCITATION

FIG. 39—SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION MOTOR (WITH ROTOR-EXCITATION)

FIG. 40—COMPENSATED SELF-EXCITED SINGLE-PHASE SHUNT INDUCTION MOTOR (WITH ROTOR-EXCITATION)

FIG. 41—TWO-PHASE SHUNT-INDUCTION COMMUTATOR MOTOR (WITH STATOR-EXCITATION)

FIG. 42—COMPENSATED TWO-PHASE SHUNT INDUCTION COMMUTATOR MOTOR (WITH STATOR-EXCITATION)

FIG. 43—TWO-PHASE SHUNT INDUCTION-CONDUCTION (COMMUTATOR) MOTOR (WITH STATOR-EXCITATION)

FIG. 44—TWO-PHASE SHUNT INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 45—COMPENSATED TWO-PHASE SHUNT INDUCTION MOTOR (WITH STATOR-EXCITATION)

FIG. 46—NEUTRALIZED TWO-PHASE SHUNT CONDUCTION (COMMUTATOR) MOTOR (WITH STATOR EXCITATION)

FIG. 47—NEUTRALIZED AND COMPENSATED TWO-PHASE SHUNT CONDUCTION (COMMUTATOR) MOTOR (WITH STATOR-EXCITATION)

CIRCUIT DIAGRAMS OF ALTERNATING-CURRENT MOTORS WITH NAMES SUGGESTED BY MR. FYNN

that the theory of alternating-current motors is too complicated to be treated in a simple manner appears preposterous to me. As to mistakes, I may have made some, but Mr. Alexanderson has certainly failed to point them out.

Mr. Alexanderson's criticism of my Figs. 13 and 14 is not well founded. He entirely overlooks the fact, clearly expressed and illustrated in my paper, that the stator winding of Fig. 14 consists of just two coils, *F* and *W*, at right angles to each other, as shown in Fig. 15, and bases his argument on the supposition that in Fig. 14 the stator winding is spread over the whole pole face.

Before launching into criticisms, particularly when expressed in the tone which Mr. Alexanderson has chosen to adopt, he should, in his own interests, have taken the trouble to read carefully his proposed victim's paper.

Mr. Alexanderson states that the removal of a few coils does not change the general characteristics of my motor No. 14. The fact is that if either coil *W* or coil *F* be cut out of circuit the motor will not operate. If *W* be cut out there will be no rotor or armature ampere turns, and if *F* be cut out there will be no field ampere turns. In this latter case there will just be "repulsion" between the *W* and the rotor conductors, but no rotation.

As to power-factor, anyone should see at a glance that my Fig. 14 must be vastly inferior in that respect; its power-factor is much lower than that of my Fig. 13 and even lower than that of my Fig. 20. The leakage in the armature axis of my Fig. 14 is very high and the motor is not self-compensating.

I confess my utter inability to understand Mr. Alexanderson's statement (ELECTRICAL WORLD, Aug. 14, page 341): "An essential part of the theory . . . directly misleading." The suggested exchange of a short-circuited emf. for a magnetizing current which is able to transfer some kind of a generated emf. back to the stator winding certainly outlines a phenomenon which is probably novel and appears to be decidedly interesting. Since it is one I have omitted to mention, I suggest that Mr. Alexanderson take the trouble to explain it. He should find no difficulty in doing so, for that which is well understood can always be clearly stated. In the meantime I draw attention to the fact that I have spoken with much precision of two rotor-speed emfs. in my comments on my Fig. 13.

When dealing with my Fig. 13 and all similar ones, I was well aware that I could explain their operation by dividing either the stator or the rotor ampere turns into two components at right angles. Either theory should, when properly handled, lead to correct results. I chose to divide the rotor ampere turns into one component in line with the stator winding and another at right angles to it. One of my reasons for this choice is the fact that the stator excitation theory is quite inapplicable to the very practical conduction motor shown in my Fig. 4, say, for the case where the rotor ampere turns exceed the stator ampere turns and α is chosen to make the ampere turns in *N* equal and opposed to the vertical rotor ampere turns. This theory appears to me to be capable of wider application, to be in better accord with the theory selected for the motors with shunt characteristic, to more nearly approach the true facts, to be more readily understandable, and to lend itself best to calculation. The only case to which it does not appear to me to be readily applicable is that illustrated in my Figs. 14 and 15. The motor there shown is of no practical value whatsoever, but has been included in order to test the correctness of my conclusions. It is difficult to imagine how the coil *F* can in any way contribute to the flux responsible for the emf. which determines the current in the short-circuited rotor. It seems necessary to say that *W* is responsible for the rotor ampere turns and *F* for the motor field.

Mr. Alexanderson's criticism of my Fig. 20 is equally unfounded. In this case I find fault with his inferences as to Figs. 13, 14 and 20. He is correct in stating that 13 ranks highest as to power-factor; 20 has a lower power-factor because it is not self-compensated, as stated on page 977, line 8, of my paper, and 14 and 15 have the lowest power-factors because they are not self-compensated and because of the poor mutual induction between *W* and the rotor. The power-factor of all these motors increases with rising speed. The reason why the power-factor of 20 is low is clearly and correctly stated in my paper. Because my explanation of phase compensation does not agree with that which Mr. Alexanderson has in mind, he just dismisses it as false without stopping to consider whether he has the same theory in mind as the one on which my explanation is based. Let him show where *my* statement is erroneous; the fact that the same phenomenon can be explained in different ways in no way vitiates either explanation.

As to Fig. 17, the inference that the machine is self-compensated is correct. When Mr. Alexanderson succeeds in showing just where the alleged mistake as to this point is to be found, I shall be glad to correct it.

Mr. Alexanderson's remarks as to my Figs. 21 and 35 again show the difficulties he is laboring under. When 21 is standing still, the motor field is produced by a current taken directly from the mains and sent through the rotor by way of the brushes f_1 f_2, hence this machine is referred to as "separately excited." The method of obtaining the excitation does not change when the rotor begins to move. Rotation of the rotor conductors in the transformer flux due to *W* does, however, produce an emf. which appears at the exciting brushes and is of such phase as to oppose the reactance emfs. in the primary motor circuit. While the machine is *self*-compensating, as stated on page 978, line 7, of my paper, it has not been found necessary to refer specifically to this feature in order to differentiate sufficiently this motor from others. No. 35 is classified as self-excited because the exciting emf. is generated in the machine itself. It is non-existent as long as the rotor does not revolve. The emf. derived from *T* in my Fig. 35 has nothing whatever to do with the excitation of the machine. The machine has all the excitation it requires before *T* is introduced, as evidenced by my Fig. 34. The introduction of the compensating emf. derived from *T* does not influence the motor speed as does an exciting emf. All the above statements are susceptible of experimental proof as is now well known to all experts in this field.

Mr. Alexanderson has used the expression "repulsion" in connection with my Figs. 13, 14, 20, 21 and 35. Will he not please define the term so we may form an opinion as to the aptness of its application to said motors?

I have made definite proposals as to the interpretation of the diagrams I have suggested, and no such confusion as alleged by Mr. Alexanderson will arise in the mind of anyone who will take the trouble to read my paper attentively. The four typical windings illustrated by Mr. Alexanderson are all covered by my Fig. 13, thus readily disposing of the many difficulties he seems to perceive in this connection.

The sooner Mr. Alexanderson will show the "even greater confusion" which he alleges exists in connection with any of the other motors, the greater will be my gratitude.

I wish Mr. Alexanderson would select the theory which appeals to him most, apply it to each of the

types I have dealt with, outline it in each case as fully as I have done, and then suggest names for the various motors. I am confident that he will be somewhat surprised at the result. But let him so outline his theory that "an accurate understanding of each phenomenon" is possible to others than himself. If he selects a workable theory and handles it correctly, he will arrive at the same result as I have.

St. Louis, Mo. V. A. Fynn.

Dr. Rosenberg Against Class Distinctions Which Do Not Exist

Mr. Fynn's paper is a work of great merit, although, in my opinion, he does not achieve his object to create such names as to "positively identify" each of the numerous varieties of the alternating-current commutator motor. In itself it would seem a very desirable object to do away with the confusion in names existing at the present time. It is, however, hardly necessary to be so ambitious as to comprise in the scheme of names every child of the great family, as so many of them are stillborn and since many more of those who ever saw the light of the day have expired by now. The survivors are very few, and they have a great resemblance to one another.

Nobody would trouble at the present time to give distinctive scientific names to all the forms of magnet systems for continuous-current machines which were invented thirty and twenty years ago. Every new form of field magnet had then its name, and for every form special advantages were claimed by its author; but forms and names sank into oblivion when the principle of the magnetic circuit and the methods of manufacturing were understood.

The history of the alternating-current commutator motor is similar. Every inventor tried to show that his motor was radically new, entirely different from anything known up to then. It was so entirely different only because the principles of the action were not fully understood.

Mr. Fynn shows correctly the great similarity in the working principle of all alternating-current motors, although he does not, perhaps, point out sufficiently what important bearing on the commutation the *strength* of the field acting in the direction of the brush axis has, and how, therefore, motors with apparently quite similar field structure may differ entirely in the useful speed range permissible by commutation. If this be not made clear, the student will never understand the difference between a series and a repulsion motor, and why so many attempts have been made to form transition stages between these two forms.

It is regrettable that Mr. Fynn wants to replace the name of "repulsion motor" by the term "induction motor." One can quite agree with Mr. Fynn that a commutator motor "in which the energy required by its armature is conveyed to it by induction" has no more claim to work on the repulsion principle than any other kind of commutator motor. But one could say just as well that it has no more claim to work on the induction principle than any other kind of continuous-current or alternating-current machine. The important thing, however, is that the name of repulsion motor is established for this type of machine since many years, and it is—with some good will—easy enough to explain the name to the student. The action between a stationary primary and a short-circuited movable coil of an apparatus of the dynamometer type can certainly be explained by repulsion, and we know that the torque produced by this repulsion varies with the angle between rotor and stator axes. We know that the angle between the rotor and stator axes can be kept constant by replacing the single-axis rotor winding with a commutator winding and a pair of short-circuited brushes, and we are certainly still entitled to speak of repulsion.

I readily concede that the working of the motor can be explained without ever mentioning the phenomenon of repulsion, but considering that our supply of short characteristic names is so exceedingly limited in all spheres of technical science, we should not, without cogent reasons, drop an established name. Names in general, whether personal, geographical or technical, are seldom logical, but the important thing is to associate a certain name with a certain object. Even if the name does not check with the new insight into the object's function, it is in most cases better to stick to the old name, and to explain it, with the witty grammarian, as "lucus a non lucendo." Certainly, an existing name should not be exchanged for another name well known, well defined and well established in connection with an important class of rival apparatus. The user does not go into the intricacies of theory, and for him there exist only two classes of alternating-current motors, induction motor and commutator motor. Mr. Fynn describes some forty modifications of the latter one, but they all agree in the one feature, that they are possessed of a commutator—and commutator troubles! Confusion is transplanted from the scientific into the commercial domain if a commutator motor, just because a certain winding acts inductively, is suddenly called induction motor, which term is identified, scientifically and commercially, with the squirrel-cage and slip-ring motor.

It does not seem to me that Mr. Fynn's strict distinction of working brushes, exciting brushes, and brushes producing both working and exciting ampere turns can be maintained. Even different coloring is used in the diagrams for the three classes of brush. There is no "working brush" which does not contribute exciting ampere turns—at least under certain working conditions. Mr. Fynn shows motors (for instance Fig. 16) in which the internal currents flowing in the armature turns short-circuited by the brush are a most important factor of excitation. But it is wrong to neglect these currents in other motor types. We know, for instance, that in the series motor transformer action produces in the armature turns short-circuited by the brush a current opposing the primary field excitation. The object of every designer is to counteract the brush emf. created by transformation (primarily with the object of obtaining passable commutation), and to keep by the addition of an approximately opposing emf. the resultant of the two for a given working range within proper limits; but whenever the one or the other component prevails we shall also get a magnetizing effect of the working brushes.

A striking example of how the viewpoint can change plain "working brushes" (in Mr. Fynn's scheme marked *a* and colored black) into brushes of the combined function (marked *b* and shaded) is presented by Mr. Fynn's explanation of Figs. 3 and 4 and Figs. 14 and 13. Fig. 3 shows the "neutralized series motor," Fig. 4 the "neutralized series motor with rotor excitation." The difference between the two motors is that the first one has a two-axis stator winding, the axes being respectively in line with and at right angles to the brush axis, while the latter one has a single-axis stator winding inclined to the brush axis. The analogous arrangement in repulsion motors is shown in Figs. 14 and 13 respectively, with the attributed names of "single-phase series-induction motor" and "self-excited single-phase series-induction motor with rotor excitation." This distinction seems to be entirely artificial and could well be avoided if, in the cases of Figs. 4 and 13, the stator field were

split up into components instead of the rotor field. It is the usual thing in mechanical problems (for instance, in the case of a load supported by an inclined plane) to split the working force into two components, one of which can work freely and the other of which is directly counteracted by some force of reaction. If we replace in Fig. 4 the mmf. of the coil N by two components, the one tending to create a field in the direction of the brush axis and the other at right angles to it, the stator and rotor fields become identical with Fig. 3 and the brushes need not change their color. The explanation of the motor action is then much simpler. One stator component is directly opposed by the armature reaction and its only influence on the motor field is an indirect one (by creating or preventing circulating currents under the brushes); the other stator component acts freely, only supported or opposed by the brush currents. If the latter are negligible, the field is plainly represented by $N \sin \alpha$, whatever the number of rotor turns, and there is no necessity of dividing the rotor turns into torque-producing and exciting turns, and to obtain the real torque by the algebraic sum of the torque produced by the legitimately torque-producing turns rotating in a fictitious horizontal field and the illegitimate torque due to the movement of the exciting turns in a field produced by over-neutralization or under-neutralization.

Of course, both ways of considering the phenomenon produce the same result, and for a student it may be very useful to find out for himself that there are more paths than one leading to the same truth. In certain cases of motors with defined polar projections Mr. Fynn's method, as used for Fig. 4, might even have distinct advantages; but the example will show that the method creates on paper class distinctions which do not exist in reality and which it is undesirable to introduce. This refers both to the three classes of brushes and to the different classes of stator windings introduced by Mr. Fynn.

Mr. Fynn's definition for separate excitation and self-excitation does not seem to recommend itself. Many other of his definitions could well be accepted, at least as the basis of an understanding.

Cheshire, England E. ROSENBERG.

Station and Operating Practice

A Department Devoted to the Problems of Installation, Operation and Maintenance of Equipment for the Economical Generation and Distribution of Electrical Energy for All Uses.

A. C. SERVICE FROM BATTERY

Facilities Provided for Isolating Substation from High-Tension Feeders and Automatically Inverting Action of Motor-Generators

BY J. A. WALTON

A storage battery has been installed in one of the Boston Edison substations to carry the alternating-current load whenever the normal supply is for any reason interrupted. This has been made possible by floating the battery on direct-current busbars, normally energized by motor-generator sets, and providing control equipment which will in emergencies allow the battery to feed back into the motor-generator sets, thereby maintaining alternating-current service in the distribution system connected to the same busbars as the motor generators. The substation in which this equipment has been installed was already equipped with motor generators supplying energy for street-railway service, so that the chief change required, aside from installing the battery, was to provide an automatic control system which in emergencies would isolate the alternating-current busbars from the incoming feeders and maintain a constant frequency in the distribution system. To

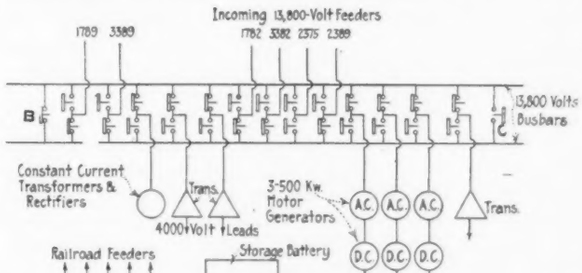


FIG. 1—CONNECTION OF EMERGENCY-SUBSTATION EQUIPMENT—REVERSE-CURRENT RELAY A OPENS BUS-TIE SWITCHES A AND C

make the motor generators operate satisfactorily with power supplied from the reverse direction to normal, changes were made in the shape of the pole faces and series windings. The subsequent synchronizing of the

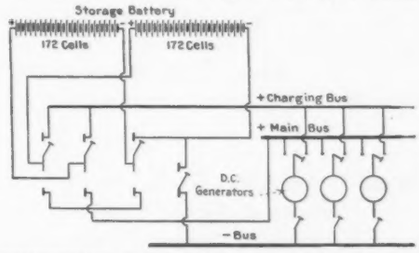


FIG. 2—SWITCHING FACILITIES FOR CHARGING EACH HALF OF BATTERY IN PARALLEL

motor generators with the normal supply of energy is performed by manually operated devices.

The accompanying line diagrams show how the apparatus is controlled. When any disturbance occurs which causes the battery to discharge at or above a predetermined rate the reverse-current relay closes its contacts, causing the bus-tie switches to open, thus leaving the motor generators and distributing transformers on one set of busbars and the incoming feeders on the other set. At the same time the contact circuit of a battery-voltage regulator is closed, so that the pressure across the direct-current end of the motor-generators can be maintained constant and the speed or frequency kept at the proper value. This regulator operates the end-cell slider, but the latter may be controlled manually when desired. The bus-tie switches are provided with instantaneous overload relays and the incoming feeder switches with definite time-limit relays so that the latter will open last.

After the normal supply of energy is restored the next step is to synchronize all of the motor-generators with the incoming feeders. This is done by adjusting their speed or frequency with a field rheostat which is connected in common with their field circuits. A syn-

chroscope is connected with the potential transformers on the incoming feeder bus and with the motor-generator bus. When the system is operating as a unit again, the field flux of the motor-generators is adjusted so that they will take their normal load and charge the battery. The reverse-current relay then opens automatically, breaking the contact circuit of the battery-voltage regulator and allowing manual operation of the end-cell slider.

Since the direct-current voltage of the motor-generators cannot be built up high enough to charge the entire battery when the cells are connected in series, and

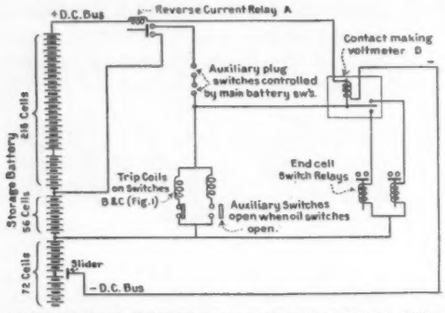


FIG. 3—AUTOMATIC EQUIPMENT WHICH PERMITS BATTERY TO CARRY ALTERNATING-CURRENT LOAD

as no boosters are installed, double-throw switches are provided which make it possible to connect each half of the battery in parallel and charge from the railway bus. When these switches are in the position for charging, they open auxiliary plug switches in the regulator-contact circuit so that the end-cell slider cannot be worked automatically.

The battery consists of 344 H-29 Exide cells, seventy-two of which are end cells. When discharged at the one-hour rate the battery has a rating of 1350 kw., whereas at the twenty-minute rate it has a rating of 2700 kw. Very seldom do disturbances cause interruptions to service of more than five minutes.

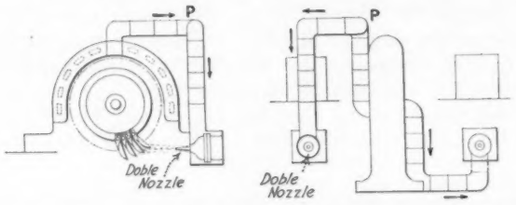
How a Small Tent May Be a Useful Addition to Outfit of Cable Crew

On windy winter days a cableman's helper has trouble starting and maintaining a fire in the gasoline furnace used by him to heat paraffine, pitch compound and solder. To eliminate this trouble one utility company in the Middle West provides each cableman with a small canvas tent that may be pitched at the edge of a manhole. In paved city streets twenty-penny spikes have been found satisfactory for holding the tent edges in place. In the accompanying illustration a suitable type and size of tent is shown in use.

A TENT USED TO SHIELD GASOLINE FURNACE FROM WIND

Improved Ventilation of Generator Permitted a 28 Per Cent Greater Load

On account of excessive heating it was formerly impossible to carry more than 3600 kw. on a 3000-kw., 6600-volt, three-phase waterwheel generator in the South Power House hydroelectric station of the Northern California Power Company. The generator was of the self-ventilated type having fans on the rotor and ventilating ducts in the stator core and frame. To overcome this trouble the ventilating scheme shown in the accompanying illustration was resorted to. The ventilating holes in the generator frame were plugged on one-half of each side, and the other half was covered by a sheet-iron hood riveted to the frame. From the hood on each side a pipe was led as shown to the nozzle



VENTILATING DUCTS ARRANGED TO DRAW AIR THROUGH GENERATOR

of each of the two Doble waterwheels driving the generator. The nozzles were partly inclosed by a hood at the end of the pipe from the generator so that suction due to the water jet would draw air into the generator around the shaft and out through the windings. This scheme worked very successfully, making it possible to carry 4600 kw. on the generator with no greater heating than with 3600 kw. before the ventilating arrangement was used.

VALVE REQUIREMENTS OF BOILERS

The Use of Stop and Non-Return Valves to Make Station Operation Safe and Flexible

BY T. W. REYNOLDS

In a recent discussion before the Ohio Society of Mechanical, Electrical and Steam Engineers the location of stop and non-return valves in steam plants was taken up. Besides the use of stop valves at steam outlets of the boilers connected to a common header, it was suggested that stop valves or quick-closing types of gate valves with drains attached should be placed in all engine branches of a loop system of piping to prevent serious results from the sudden flow of steam due to unusual conditions such as bursts in pipes or wrecking of an engine.

In the opinion of the writer, any emergency benefit secured through the use of an automatic valve at each steam engine would not justify the expenditure of money, particularly when money is more urgently required for other precautionary measures. Furthermore, the bursting of a steam pipe at an engine is rather a remote contingency not to be compared with the problem of safe boiler operation. Expenditures for safety devices should be made to apply to the points where the greatest safety is urgent. Piping when gravity-graded with the flow of steam and properly dripped, together with the use of eccentric fittings and reducers, will eliminate the dangerous element of water-hammer, arising mainly from the sudden admission of high-pressure steam into cold vacuous pipes. In the erection of steam mains special care should be used in their support, with proper allowances made for their expansion, which is an irresistible force under variable temperatures. The bursting of fittings is a more frequent

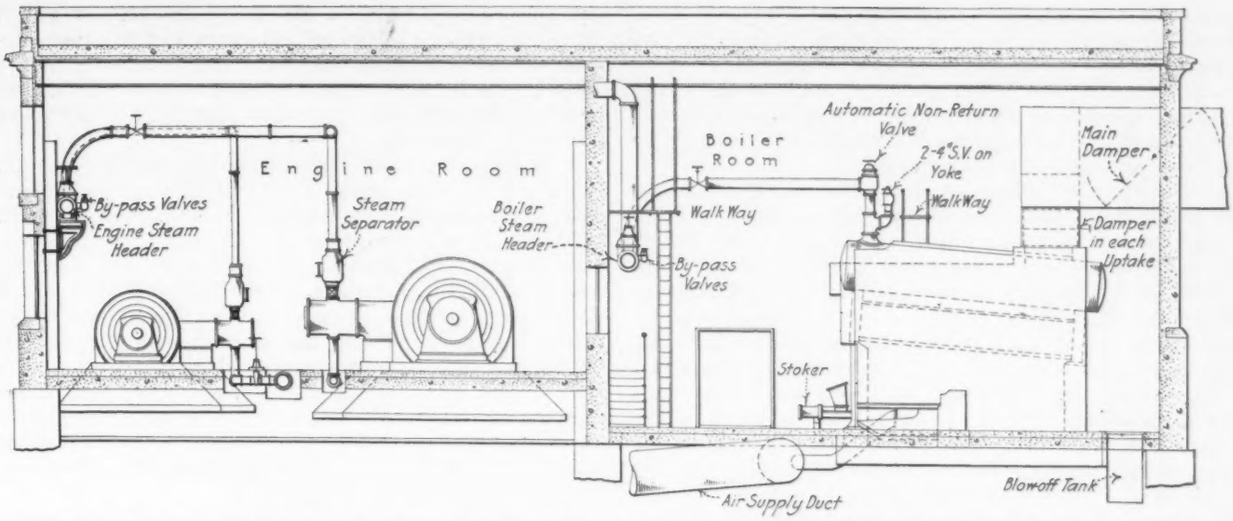


FIG. 1—ENGINE AND BOILER ROOM OF MISSOURI STATE CAPITOL, JEFFERSON CITY, SHOWING CONTROL VALVES

cause of injuries to workmen in a plant, and these often result from the neglect of the above remarks. Expansion joints and sweeps by easy bends in the piping, the more important apparatus being arranged in duplicate and two blow-off valves used at each blow-off of the boiler, will further tend to insure a minimum number of break-downs. There are many other devices worthy of note, for instance, automatic engine stops, feed-water regulators, pump governors, and other pump-regulating devices.

In the case of the automatic stop valves at the boilers, these are essential to prevent scalding of operators when tubes burst, and they make it impossible to turn steam into a cold boiler and prevent a boiler being cut in when the pressure is below the line pressure. A pipe bursting at a steam engine could not empty the boilers so quickly as the bursting of a steam header. In any event, the automatic valves at the boilers would close under the former conditions, or the two main stop valves, one at each end of the steam header, could be closed, as these are somewhat remote from the possible danger zone under discussion.

The boiler is the source of power, and therefore this storehouse of energy is to be guarded more than its many feeders. In all station designs provisions should be made to render accessible the more important and

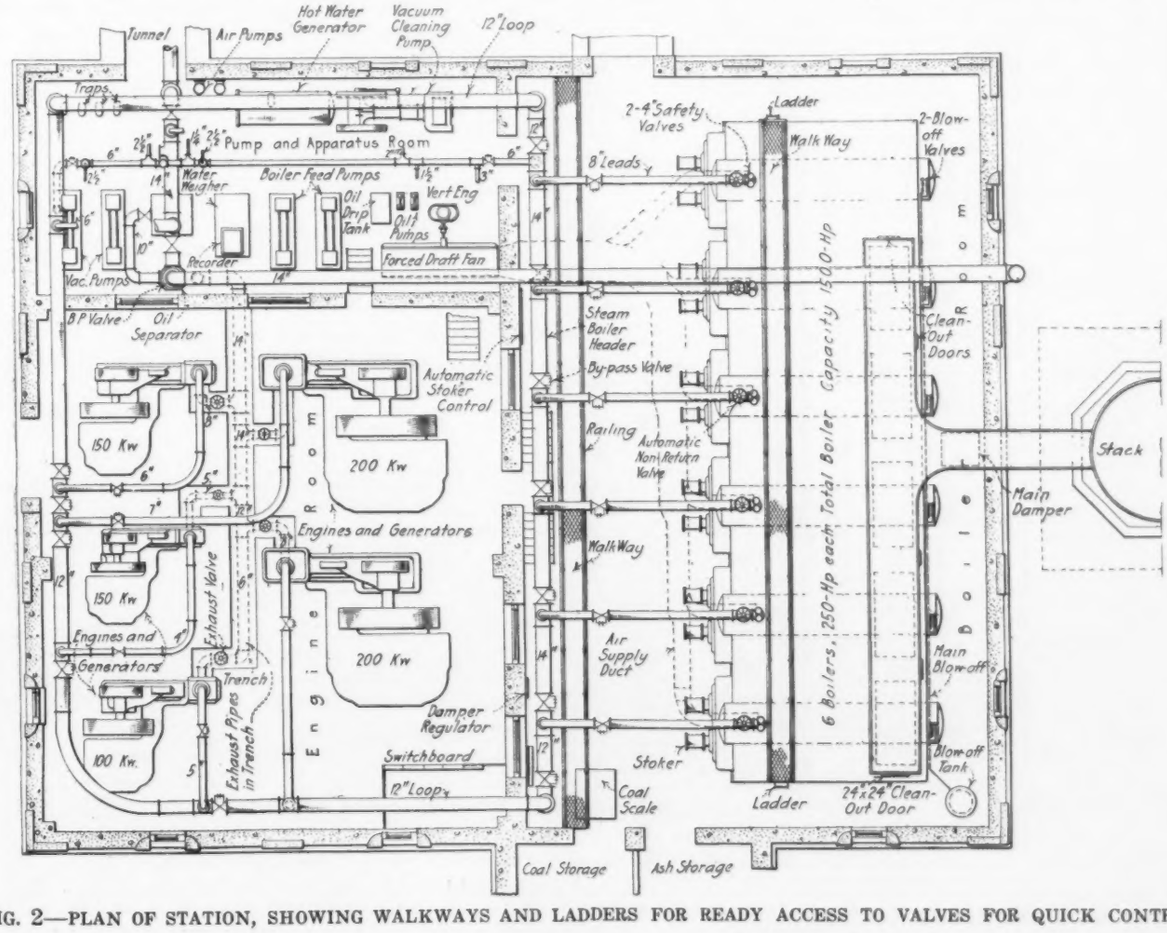


FIG. 2—PLAN OF STATION, SHOWING WALKWAYS AND LADDERS FOR READY ACCESS TO VALVES FOR QUICK CONTROL

controlling valves. The accompanying plan and elevations, prepared by Tracy & Swartout, architects, and the Richard D. Kimball Company, engineers, of New York City, for the power plant of the Missouri State Capitol, show how ready access to control valves may be secured by independent ladders to walkways with railings and connecting cross-walks.

The important valves of a boiler installation should be grouped for quick control from the walkways. Likewise, the steam header may, in an emergency or at other times, by the proper manipulation of the stop valves be divided into sections as desired. Supervision of the plant is made simple by such arrangement of apparatus and of the structure itself. The leads to the engines should be made by means of long sweep bends with valves controlled from the floor, while the steam header from which the leads are taken may be similarly valved and controlled. All valves used in the installation shown are of the outside screw and yoke type, those over 5 in. in size being fitted with a by-pass for the equalizing of the pressure either side when it is desired to open or close the valve. As a double precautionary measure, two 4-in. pop safety valves with testing chains to the floor are used on each boiler, while the leads from each are equipped with an automatic non-return valve with an ordinary stop valve installed beyond. Each boiler has a capacity of 250 hp., the total rating of the installation being 1500 hp. The blow-offs are each fitted with two blow-off valves.

MOTOR DRIVES IN COTTONSEED-OIL MILL

Requirements in a Southern Oil Mill Using Cold Process, and Energy Used per Unit of Product Handled

Data on the equipment of a cold-process cottonseed-oil mill and the electrical consumption per unit of product handled are presented in the accompanying tables. The figures are taken from the records of the Sea Island Cotton Oil Company of Charleston, S. C., which can produce 28 tons to 30 tons of seed per twenty-four hours. The entire mill is electrically operated by eleven motors of an aggregate rating of 233 hp. As shown by Table II, the total energy consumption was 81.05 kw.-hr. per ton of seed crushed and 1.801 kw.-hr. per gallon of oil produced. In the second column of the table figures are given showing the proportion of the total energy used by each motor. In the third column the energy consumption per unit of product handled for the same motors is presented.

Both Sea Island and Upland seed are used in this mill. As a considerable quantity of lint adheres to Upland seed, six linters are required to clean the raw product. With Sea Island seed, however, only one linter is necessary as the seed comes to the mill very clean and in a smooth and shiny condition. The Upland seed is hulled before being ground, whereas the Sea Island seed is fed into the grinders direct. As a result, when using Sea Island seed the following machines can be shut down: Five linters, two hullers, one hull conveyor, separating screens, and a number of conveyors and bucket elevators. These machines are driven by motors Nos. 3 and 4. The power required in preparation of the seed is, therefore, considerably reduced.

On the other hand, when working with Sea Island seed the meats and hulls are both fed to the expellers, therefore more power is required in extracting the oil than when working with Upland seed. The shafts are arranged, however, so one of the expellers and the screw conveyor of the heating tubes can be taken off motor No. 6 and connected with No. 5, thereby equalizing the load. The attrition mills also require more power when working Sea Island cakes than when working Upland cakes owing to the hard particles of hulls.

Although the plant works twenty-four hours a day, the heaviest part of the load occurs from 7.30 a. m. to about 5 p. m., the average load with Upland seed being about 140 kw., while with Sea Island seed the load is about 110 kw. The corresponding night loads are 110 kw. and 80 kw. respectively.

Each piece of apparatus used in the mill is grouped in Table I with the motor driving it. A filter is now being installed to clarify the oil drawn from the settling tanks before it is pumped to the storage tanks. The main building and other buildings are lighted by eighty-five lamps, rated at 25 watts to 100 watts each, and the yard is illuminated by one 1000-watt gas-filled lamp installed on a water tower about 50 ft. from the ground. All of

TABLE I—ELECTRICAL EQUIPMENT AND APPARATUS DRIVEN

Group No.	Location of Motor	Hp.	R.p.m.	Make and Type	Machines Driven
1	Wharf	3	1130	West. C.S.	Inclined conveyor for transferring 100-lb. sacks from boats to flat cars.
2	Seed house	5	1130	West. C.S.	Inclined sack conveyor delivering to horizontal conveyor 16 ft. high, also connected with horizontal screw conveyor delivering to inclined screw conveyor.
3	Shaker room	35	1155	G. E. L.	15 ft. of line shaft with four roller-bearing hangers, speed 500 r.p.m.; one No. 1 Huller (Atlanta Utility Works); two 106-saw linters (Carver Cotton Gin Company).
4	Shaker room	30	1150	West. C.S.	20 ft. of line shaft with four roller-bearing hangers, speed 500 r.p.m.; one 106-saw linter (Carver Cotton Gin Company); float shaft for three linters (driving condensing rolls and seed rolls); one inclined drag conveyor to hull house, 160-ft. centers; one inclined drag conveyor for hulls, 12-ft. centers; one 9-in. screw conveyor; one 6-in. screw conveyor.
5	Shaker room	50	1145	West. H.F.	35 ft. shafting with seven roller-bearing hangers, speed 500 r.p.m.; one No. 3 huller (Atlanta Utility Works); three 106-saw linters (Carver Cotton Gin Company); one bucket elevator, 26-ft. centers; one hull beater; two single shakers; two double shakers; two inclined hull drags; one float shaft for three linters (driving condensing rolls and seed rolls); one bucket elevator, 18-ft. centers; one 1-kw. direct-current, 110-volt generator for linter magnets; one screw conveyor; one inclined screw conveyor 60 ft. long (for conveying seed from seed house to mill); two seed feeders; one screw conveyor, 6 ft. long; one gin-saw sharpening machine.
6	Expeller room	50	1145	West. H.F.	38 ft. shafting with six hangers, speed 300 r.p.m.; four Anderson cold-process expellers; four 9-in. x 18-ft. screw conveyors for heating tubes; one 18-in. screw conveyor and agitator for tempering trough; six screw conveyors to and from expellers; one 4-in. rotary oil pump; one 6-in. rotary oil pump; one small air compressor used for blowing out motors; two bucket elevators, 20-ft. centers; one screw conveyor to cake storage room.
7	Attrition-mill room	2–20	1710	West. C.C.L.	Mounted directly on ball-bearing shaft of Sprout Waldron attrition mill. NOTE—Motors revolve in opposite directions. They are reversed from time to time by means of the double-throw switch so as to get the utmost use of the grinding plates.
8	Attrition-mill room	5	1735	West. C.S.	15 ft. shafting on three hangers, speed 250 r.p.m.; three bucket elevators, 10-ft. centers; three screw conveyors, 8 ft. long; one cottonseed-meal reel for bolting; two screw conveyors; one automatic scales; feed to attrition mill.
9	Hull house	5	1130	West. C.S.	Type C cotton-seed hull packer (Barnard & Leas Manufacturing Company).
10	Gin house	10	865	G.E. K.	10-ft. line shaft on two hangers, speed 300 r.p.m. on short cotton and 230 r.p.m. on Sea Island grabbots; one 60-saw gin; one bailing press; one grabbot cleaner; one 30-in. suction fan.

TABLE II—PROPORTIONS OF TOTAL ENERGY USED BY EACH MOTOR AND CONSUMPTION PER UNIT OF PRODUCT HANDLED

(Based on a seasonal energy consumption of 321,460 kw.-hr., handling 3965.9 tons of seeds and producing 2925 tons of meats, 2285 tons of cakes and 117,866 gal. of oil.)

Group No.	Percentage of Total Energy Consumption	Kw.-hr. Consumption per Unit of Product Handled
1	0.034	0.0416 per ton unloaded*
2	0.042	0.0515 per ton seeds
3	10.04	8.16 per ton seeds
4	8.89	.....
5	31.00†	.....
6	30.44	33.25 per ton meats‡ or 0.552 per gal. oil‡.
7	8.12	11.77 per ton meal
8	0.94	1.364 per ton meal
9	0.77	6.06 per ton hulls¶
10	1.00	10.24 per bale ginned¶
Discrepancies	7.384	.....
Lamps	2.34	.....
Total	100.00	81.05 per ton seeds 1.801 per gal. oil

*2644 tons unloaded. †Estimated, as meter burned out. ‡These figures should be slightly greater, as one of the expellers and a heating-tube conveyor were changed two months before the season ended to run on motor No. 5. ¶This s for ginning 316 bales and baling 607 bales, of which 321 were linters.

the energy for lamps except those on the seed-receiving wharf is supplied by a 7.5-kw., 440/110-volt transformer. The power transformers are installed in a vault and consist of two 100-kva., 2200/440-volt single-phase Westinghouse units connected in open delta.

The circuit from the switchboard to the large motors is controlled by a 300-amp. oil switch. All motors rated at 30 hp. or above are equipped with full automatic oil circuit-breakers. The two 20-hp. motors driving the attrition mill are controlled by a 200-amp. triple-pole, double-throw reversing and disconnecting switch and also a starting compensator with overload relays. The 10-hp. motor in the gin house is equipped with a starting compensator with overload relays, while the remainder of the motors are controlled by triple-pole, double-throw switches. All motors except the three 5-hp. and the one 3-hp. motor are protected by fuses and inverse time-limit overload relays and no-voltage release. The energy consumed by each motor is measured by individual meter.

The information presented in this article is drawn from a paper entitled "Electric Drive in a Cottonseed-Oil Mill" presented by J. W. Ruff at the convention of the Southeastern Section of the National Electric Light Association held at Asheville, N. C., Sept. 22 to 24. Mr. Ruff, who is connected with the Charleston (S. C.) Consolidated Railway & Lighting Company, supervised the laying out of the electrical equipment in the mill mentioned.

Leakage Through Insulation, and How It May Show Up in Repair Work

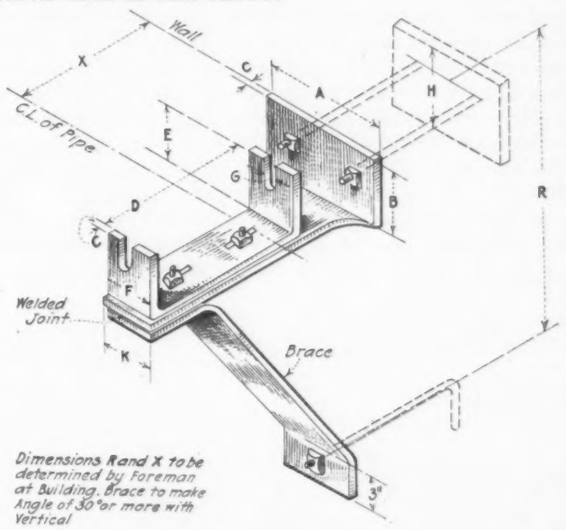
BY E. C. PARHAM

Insulation that may seem perfect when used with one voltage may be practically useless when used with a higher voltage. In any case insulation may be considered as a high-resistance current path between the conductors on which it is used with this current path in parallel with the normal path of the working current. It then follows that the amount of leakage current that will flow through one path formed by a pair of insulators, for example, depends upon the quality and upon the disposition of the insulation and upon the value of the voltage to which the insulation is subjected. The total leakage current to be supplied by a station generator will depend upon how many of these leakage circuits are in parallel. If the leakage path of one pair of 500-volt insulators measures 1,000,000 ohms, for example, the leakage current of a single path will be $500 \div 1{,}000{,}000 = 0.0005$ amp.; with 5000 such paths in parallel, however, the total leakage current will become $5000 \times 0.0005 = 2.5$ amp. This corresponds to a constant drain of nearly 2 hp. The higher the voltage, the greater the horsepower per ampere.

When testing the insulation of armature coils one at a time while they were being installed in the core slots an armature winder became gravely concerned because a 600-volt voltmeter on a 550-volt line showed deflections of but a fraction of a volt. After the coils were connected to the commutator the deflection of the whole construction was about 30 volts. If the coils and core had been perfectly dry, the insulation deflection of a single coil to the core probably would have been zero at such a low test voltage. The effect of connecting the coils all together, thereby placing their leakage paths in parallel, might have increased the insulation deflection to 2 volts or 3 volts. That the high deflection in this particular case was due to a multiplicity of damp leakage paths in parallel was proved by the fact that a good baking in an oven reduced the insulation deflection of the whole armature to zero as far as that particular voltage and voltmeter could indicate.

A Convenient Form of Wall Bracket for Pipes

A convenient form of wall bracket for supporting large pipes is shown in the accompanying illustration. This is made of wrought iron and of a design adaptable to the varying sizes of pipes together with pipe rolls. Small pipes may be supported by ordinary pipe rings and wrought-iron lag-bolt hangers, but pipes of the larger sizes—that is, 10 in. and above—are best supported directly from the building walls by means of brackets such as that shown.



Pipe	A	B	C	D	E	F	G	H	K	R	X	
4	8	6	½	8	5	4	⅞	4	4			
4½	8	6	½	8	5	4	⅞	4	4			
5	8	6	½	8	5	4	⅞	4	4	Note—		
6	8	6	½	10	5	4	⅞	5	5	All Dimensions in Inches		
7	8	6	½	10	5	4	⅞	5	5			
8	10	6	⅝	10	5	4	⅞	5	5			
9	10	8	⅝	12	5	5	1	5	6			
10	10	8	⅝	14	5	5	1	5	6			
12	12	8	¾	16	5	5	1	5	6			
14	12	8	¾	18	5	5	1	5	6			

A WALL BRACKET FOR SUPPORTING LARGE PIPES

Marketing Electricity

A Department on Selling Service and Widening the Use of Electrical Energy

"Scout" Irons Solve the Trial-Iron Problem in Danbury, Conn.

The problem of the disposition to be made of irons returned from use on trial has been satisfactorily solved by the Danbury & Bethel Gas & Electric Company, Danbury, Conn., through the use of special "scout" irons. These irons have a black or buffed finish and are sent out when a customer wants an electric iron on trial. If the customer later desires to purchase an iron, the "scout" iron is replaced by one of standard finish. As these "scouts" do not show signs of use, repolishing costs are eliminated. When a customer's iron must undergo extensive repairs, a "scout" iron is loaned to the customer, thus keeping an iron in service and pleasing the customer.

How the Use of Appliances Increases the Residence Non-lighting Load

The importance of central stations pushing to the utmost the sale of appliances is well shown in the accompanying tables, which were incorporated in a paper presented by W. M. Stearns before the Southeastern Section of the N. E. L. A. The data were obtained by means of meter charts in two residences in Rochester, N. Y.

In both residences, it will be noticed, the number of appliances used is comparatively small, yet the appliance income in one case is 66.02 per cent of the total income for lighting and appliance service and in the other case 54.05 per cent. The revenue derived from heating appliances, Mr. Stearns stated, has even provided a means for offsetting a reduction in rates which meant a decrease of $50,000 a year income to the company affected. There is no lighting-circuit appliance on the market, he claims, of too small an energy consumption to be handled and pushed successfully so long as it can be relied upon to give satisfactory service to the user.

What the Customer Wants to Know Concerning the Cost of Using Appliances

The accompanying tabulation of the costs of using various electric household appliances was recently published in the monthly *Bulletin* of the Philadelphia Electric Company to impress upon the consumer the practical value of the unused minimum so often wasted by small residence consumers. The manner in which this information is presented is exceedingly clear and interesting, as it reduces the matter to equivalents that are strong in their appeal. The figures here are based on a 10-cent rate and can easily be converted to conform to any rate in force in other territories.

OPERATING COSTS OF HOUSEHOLD APPLIANCES

		Hours	Min.
If you use only 60 cents' worth of energy during the month, the remaining 40 cents will operate	An electric iron	8	....
	or a washing machine	20	....
	or a vacuum cleaner	26	40
	or an 8-in. fan	160	....
	or a 32-cp. Mazda lamp	100	....
	or a toaster	10	....
If you use only 70 cents' worth of energy during the month, the remaining 30 cents will operate	An electric iron	6	....
	or a washing machine	15	....
	or a vacuum cleaner	20	....
	or an 8-in. fan	120	....
	or a 32-cp. Mazda lamp	75	....
	or a toaster	7	30
If you use only 80 cents' worth of energy during the month, the remaining 20 cents will operate	An electric iron	4	....
	or a washing machine	10	....
	or a vacuum cleaner	13	20
	or an 8-in. fan	80	....
	or a 32-cp. Mazda lamp	50	....
	or a toaster	5	....
If you use only 90 cents' worth of energy during the month, the remaining 10 cents will operate	An electric iron	2	....
	or a washing machine	5	....
	or a vacuum cleaner	6	40
	or an 8-in. fan	40	....
	or a 32-cp. Mazda lamp	25	....
	or a toaster	2	30

Another table in which is calculated the normal cost in service of the various household appliances has just been published by the Commonwealth Edison Company, Chicago, computed on the estimated use of the various

WEEKLY ENERGY CONSUMPTION OF TWO RESIDENCES IN ROCHESTER, N. Y., SHOWING AVERAGE USE OF VARIOUS APPLIANCES AND COMPARATIVE INCOMES FROM LIGHTING AND FROM APPLIANCES

	Percolator, 400 Watts, Hours and Minutes	Toaster, 500 Watts, Hours and Minutes	Washing Machine, 200 Watts, Hours and Minutes	Vacuum Cleaner, 110 Watts, Hours and Minutes	Flatiron, 550 Watts, Hours and Minutes
Sunday	0 54	0 13			
Monday	0 25	0 9			0 51
Tuesday	0 37	0 28	0 79		0 14
Wednesday	0 46	0 30		0 6	
Thursday	0 33	0 19			0 21
Friday	0 51	0 24	2 10	0 24	
Saturday	0 17			0 39	0 60
SUMMARY:					
Hours per week	4.38	2.05	3.48	1.15	2.43
Kw.-hr. per week	1.71	1.19	0.80	0.13	1.34
Cost per week*	$0.137	$0.095	$0.064	$0.01	$0.107
Cost per month*	$0.550	$0.380	$0.260	$0.04	$0.430
Total bill, lighting and appliances					$3.36
Income for lighting					1.53
Income for appliances (54.5 per cent of total)					$1.83

	Percolator, 550 Watts, Hours and Minutes	Washing Machine, 220 Watts, Hours and Minutes	Vacuum Cleaner, 325 Watts, Hours and Minutes	Flatiron, 625 Watts, Hours and Minutes
Sunday	0 22		0 58	
Monday	0 25	4 16	1 8	
Tuesday	0 16			
Wednesday	0 17			3 43
Thursday	0 22			
Friday	0 30			0 47
Saturday	0 20			
Saturday night	0 23			
SUMMARY:				
Hours per week	2.75	4.250	2.10	2.50
Kw.-hr. per week	1.51	0.935	0.68	2.81
Cost per week*	$0.121	$0.075	$0.054	$0.225
Cost per month*	$0.540	$0.300	$0.220	$0.900
Total bill, lighting and appliances				$2.96
Income for lighting				1.00
Income for appliances (66.2 per cent of total)				$1.96

*At 8 cents per kw.-hr.

COST OF USING ELECTRIC APPLIANCES

Article	Average Rating, Watts	Time for 1 Cent	Average Service, Hours per Month	Cost per Month at 3 Cents	Cost per Month at 10 Cents
Percolator	400	50 minutes	7.5	0.090	30
Grill	600	35 minutes	7.5	0.135	45
Hair-drying comb	25	14 hours	....	....	....
Flatiron	550	40 minutes	15.5	0.260	85
Curling iron	25	14 hours	12.0	0.010	3
Polishing motor	40	8 hours	....	....	....
Sewing-machine motor	40	8 hours	....	....	....
Toaster	600	35 minutes	7.5	0.135	45
Heating pad	50	7 hours	....	....	....
Chafing dish	400	50 minutes	7.5	0.090	30
Washing machine	125	3 hours	15.5	0.060	19
Fan	90	4 hours	....	....	....
Vacuum cleaner	100	3 hours	15.5	0.050	16
Vibrator	40	8 hours	.....	....	....
Two-glower radiator	500	40 minutes	.....	....	....

devices under average conditions in the home. The Commonwealth Edison Company figures these equivalents on the basis of its 3-cent heating rate, but another column has been added to adjust the table to the typical 10-cent rate generally in force and most convenient for purposes of comparison.

The two tables reproduced present the argument from both points of view and will be of material assistance to any central station in demonstrating the actual costs of using the various electric household comforts.

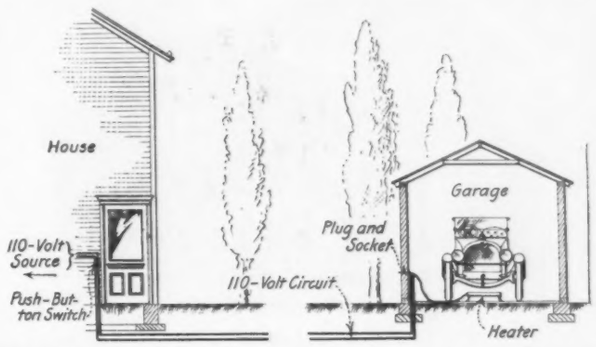
Instruction in Electric Cooking at a State Fair

Electricity for cooking was introduced this year for the first time at the Illinois State Fair, held at Springfield, Ill. Girls of the domestic-science classes who came from every part of the State to attend the session in the Women's Building were delighted when they found the kitchen equipped with electric stoves. Concluding that the future housewives of the State should know how to cook with electricity, A. D. Mackie, general manager of the Springfield Gas & Electric Company, suggested to the managers of the domestic-science school, which is conducted in connection with the fair, the idea of teaching electric cooking, offering to allow the young women free use of electric stoves owned by the Springfield company and to furnish the electricity free of charge. The managers accepted his offer, and by the time the school closed all of the girls were enthusiastic advocates of electric cooking.

Another Electrical Adjunct to the Gasoline Automobile

Even with all of the modern improvements in carburetors and self-starting apparatus, the problem of cranking his engine on cold mornings still confronts the gasoline automobile owner. Radiators filled with an anti-freezing mixture will resist very low temperatures without congealing, but if an engine is idle over night all working parts become so cold that a great deal of energy—either electrical energy or physical energy—must be expended at the crankshaft before even a sputter of encouragement comes from the exhaust muffler.

To prevent these troubles and worries some of the ingenious salesmen of the Toledo (Ohio) Railways & Light Company have been selling 500-watt air heaters to automobile owners, suggesting that circuits to feed these heaters be wired as shown in the accompanying sketch. About one-half hour before the automobile owner gets ready to use his car in the morning he has only to touch the push-button switch inside his house and the heater in the garage begins to warm up the engine and the fluid in the radiator. As the autoist leaves his house he disconnects the heater from the line; but by this time the engine, radiator and carburetor are



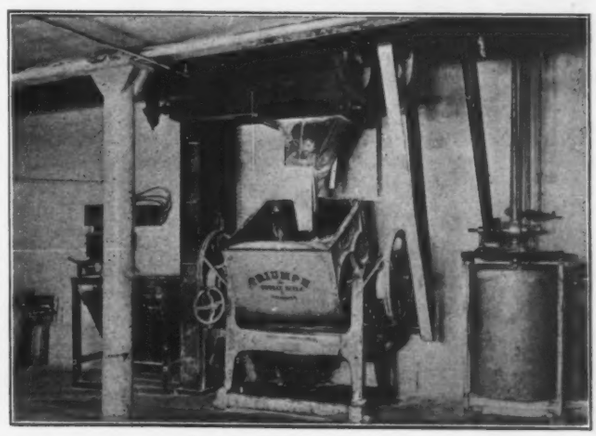
AN ELECTRIC HEATER TAKES THE CHILL FROM THE AUTOMOBILE ENGINE AND MAKES CRANKING EASY

warm, and at the first turn a liberal charge of gas is exploded in the engine cylinder and the car is ready for work. The little heater under the automobile radiator works while the autoist eats breakfast and saves his temper as well as the wear and tear on the car.

The heaters which have been used for the work are of an inexpensive portable type which can be left permanently in the garage, so that the only precaution the driver needs to take is to see that he has stopped his car in approximately the same place each time, with the engine and radiator over the electric air heater.

Motor Drive in a Bakery—Dough Mixed and Cut Into Loaves by Machinery

The accompanying illustration shows how compact and sanitary a medium-sized bakery can be made by employing motor drive. Here the flour is stored in an overhead bin from which it can be discharged directly into the mixers. From the latter the dough may be transferred, without handling, to trays on which it is cut into loaves ready for baking. Two 1800-r.p.m. motors having a combined rating of 11 hp. are employed, one rated at 1 hp. being used to drive the cake mixer, while the other, a 10-hp. unit, operates the Triumph bread-dough mixer, the Read cone sifter and a water pump. This equipment is operated about 144 hours a week. The average monthly energy consumption is 156 kw.-hr., or about 14 kw.-hr. per connected horsepower. This bakery is owned by C. T. Hanson, 3794 Broadway, New York City, and electricity is supplied by the United Electric Light & Power Company.



DOUGH-MIXING MACHINE IN A NEW YORK BAKERY

Electric Cooking in Apartment Houses

Cost Figures from Installations in Eastern and Western Cities Where Electricity Is Used Exclusively

Some interesting experience in the practical utilization of electric ranges has become available through reports from a number of apartment houses where electric-cooking equipment is permanently installed throughout the buildings. These reports cover the Carlton Court apartments in Buffalo, N. Y.; the Jensen apartments in Great Falls, Mont.; fifteen ranges in similar service in Seattle, twenty-five in Salt Lake City, and a variety of separate cases reported by the Simplex Electric Heating Company and the Western Electric Company, and their particular value lies in the fact that they provide a volume of experience sufficient to give an average result worthy of confidence.

In the Carlton Court apartments in Buffalo ninety-five electric ranges are in daily service in as many households, for electric-cooking appliances are the typical equipment of the building, no coal or gas stoves having been installed. To each one of these families cooking by electricity was a new experiment, and, as the manager of the building expressed it in a letter to the Buffalo General Electric Company: "At first the women were quite skeptical as to the practicability of the electric ranges, for not one of the tenants in the ninety-five apartments had ever used an electric range before. But after they became accustomed to cooking by electricity many said that they would never again go back to coal or wood stoves. As landlords, we are very much pleased with the manner in which the electric range is taking care of our cooking problem, for all the tenants are delighted with the modern equipment of their kitchens and

TABLE I—REVENUE FROM CARLTON COURT APARTMENTS, BUFFALO*

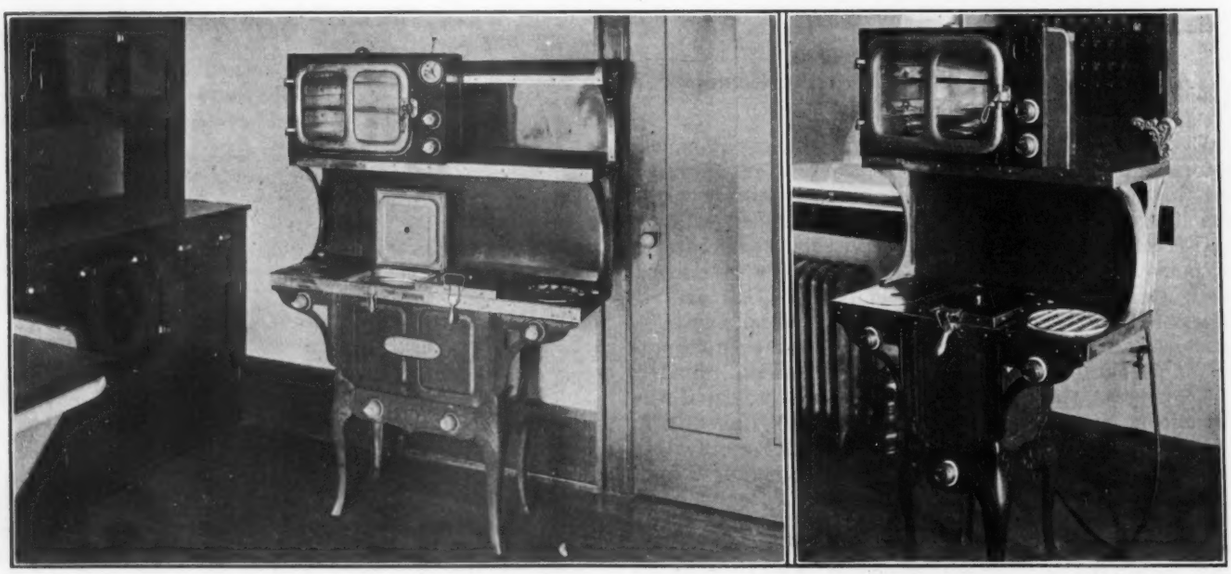
No. of Apartments	Month	Average Cost for Light and Cooking
23	May	$2.49
30	June	2.32
38	July	2.31
44	August	2.51

*Standard Electric Stove Company's ranges. Rates for energy: first 15 kw.-hr. at 7 cents; next 30 kw.-hr. at 5 cents; all over 30 kw.-hr. at 1.5 cents. Single meter for all purposes.

TABLE II—COOKING COSTS OF A TENANT IN THE JENSEN APARTMENTS, GREAT FALLS, MONT.*

Month	Bill	Cost per Person
May	$2.07	$0.295
June	1.95	0.261
July	2.46	0.351
August	2.97	0.424
September	2.91	0.415
October	2.15	0.307

*Simplex electric range used. Rate for energy, 3 cents per kw.-hr. An electric toaster and iron were also on the cooking circuit. Cooking was done ordinarily for seven persons.



TYPES OF ELECTRIC RANGES INSTALLED IN THE CARLTON COURT APARTMENTS, BUFFALO, N. Y.

TABLE III—COST OF COOKING IN A GREAT FALLS (MONT.) RESIDENCE*

Month	Bill for Month	Cost per Person for Month
November	$2.15	$0.307
December	2.49	0.355
January	2.25	0.321
February	2.46	0.351
March	2.15	0.307
April	2.25	0.321
May	2.16	0.307
June	2.25	0.321
July	2.94	0.420
August	4.42	0.491
September	3.87	0.430

*Simplex electric range used. Cooking done ordinarily for seven persons except during last two months, when meals were cooked for nine persons. Energy obtained at 3 cents per kw.-hr. Toaster and electric iron were also used on the heating circuit.

we have received a great number of letters from tenants commending the use of these ranges."

The cost figures which have developed here are surprisingly moderate, and are, indeed, satisfactory both to the consumer and to the local central station, the Buffalo General Electric Company, for experience proves that, at the rates in force in Buffalo, cooking can be done exclusively by electricity at an actual saving over the normal cost of cooking with some other fuel and of light for the average home of comparable size.

Table I herewith covers four months of this year, during which time the number of families reporting increased from twenty-three to forty-four, yet average costs did not vary appreciably.

The data from Great Falls, Mont., in Tables II and III carry the subject of costs a bit further. Table III reports the expense of electric cooking per person, based on the experience of a family of seven who use an electric range, a toaster and a flatiron all connected from a separate cooking circuit.

There is a natural variation in these figures, as is to be expected, since the cost of cooking will be strongly affected by the cooking of an unusual number of roasts, for instance, in any one month, or, on the other hand, by the absence of the family on a week-end visit. The range of monthly cost per person—from 26 to 42 cents—provides a basis for calculation, however, and an impressive bit of human interest for the consideration of the prospective customer. A similar diversity is seen in the data from costs in Salt Lake City in Table IV.

A comparative table of eighty-three ranges in household use in Worcester, Mass.; Salt Lake City, Anaconda, Mont., and Great Falls reports on the matter of maximum demand, which naturally is a factor that will go far toward molding the attitude which many companies will take toward this great future market for service. Here again (in Table V), though there is considerable variation, the figures are adequate to the purpose.

TABLE IV—COOKING DATA ON INSTALLATIONS IN SALT LAKE CITY*

Type of Range	Number of Persons in Family	Average Cost per Person per Day, Cents	Average Kw.-Hr. per Person per Day
R-I	6	3.3	1.10
R-I	3	1.3	0.43
R-3	3	2.1	0.70
R-3	5	1.4	0.466

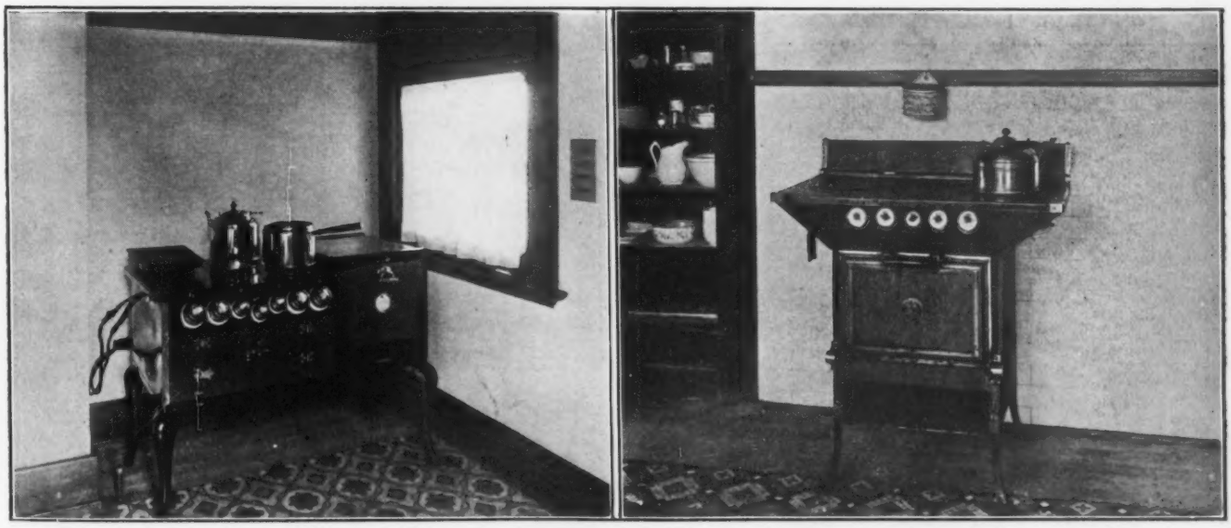
*General Electric Company's domestic ranges. Rate for energy, 3 cents per kw.-hr.

TABLE V—OPERATING COST AND LOAD DATA ON FOUR APARTMENT-HOUSE INSTALLATIONS*

Location	Kw.-Hr. per Person per Day	No. of Ranges	Rated Load, Kw.	Maximum Demand, Kw.	Maximum Load to Rated Load in per Cent
Worcester, Mass.	0.93	16	77	13.5	17.50
Great Falls, Mont.	1.12	21	110.25	13.5	12.35
Salt Lake City, Utah.	0.85	24	77	11.5	15.00
Anaconda, Mont.	0.97	22	92	.....	.....
Average	0.96	.....	.....	12.8	15

*Total of 83 Simplex Electric Heating Company's ranges.

The equipment of an apartment house at Worcester, Mass., with Simplex electric ranges in each suite has attracted much attention. Data have been collected which show the average energy consumption per person to be 28 kw.-hr. a month, representing an expenditure for electricity of only 84 cents on a 3-cent rate, $1.12 on a 4-cent rate, and $1.40 on a 5-cent rate. There are sixteen ranges in the Worcester installation, and the rated load is 77 kw. The maximum demand is 13.5 kw., the ratio of maximum demand to rated load being 17.5 per cent. The suites in the Irving Street apartment house at Worcester are occupied by two and three persons, the total for the sixteen suites being thirty-seven. Monthly bills per suite range from 63 cents to $4.35.



ELECTRIC COOKING INSTALLATIONS ON THE LINES OF THE BUFFALO GENERAL ELECTRIC COMPANY

MOTOR-DRIVEN GATHERING TABLE IN A BINDERY

Revolving Gathering Table in a Louisville Bindery

An electrically operated revolving gathering table is used in the plant of the Standard Printing Company at Louisville, Ky., for assembling folded, printed sheets for binding into finished books. Heretofore it has been the practice for the gatherers, usually girls, to walk up and down along rows of benches or tables taking the folios from piles, one at a time. With the revolving table, however, the gatherers may sit and pick off the sections as they pass. The table was devised by Edward Gottschalk, manager of the printing company. It measures 12 ft. in diameter, and ten gatherers or more can work at it. The table is driven by a 2-hp. adjustable-speed motor. The top is large enough for any ordinary work. The Kentucky Statutes, in 2900 pages, were handled with ease on this table, and with a double deck it could handle a dictionary, it is declared.

Sewing for the Red Cross

The Edison Electric Illuminating Company of Boston has recently featured some very interesting demonstrations of electric sewing machines in which materials for the Red Cross were sewn by the demonstrator. These demonstrations were given in the company's various district stores, and an offer was sent to different societies that were engaged in doing work for the Red Cross putting the machines at their disposal. Naturally a great deal of interest was aroused by the fact that the machines would be shown while sewing for the soldiers, and this touch of human interest increased the attendance at the demonstrations materially and, of course, stimulated the sale of electric sewing-machine motors.

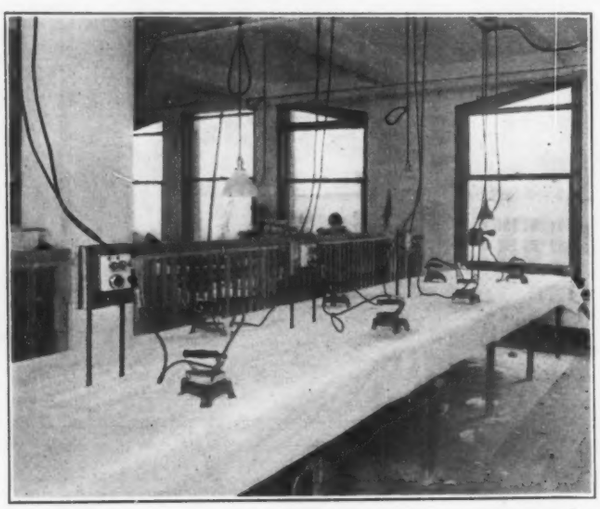
Collections Interfere with Salesmen's Efforts to Get New Business

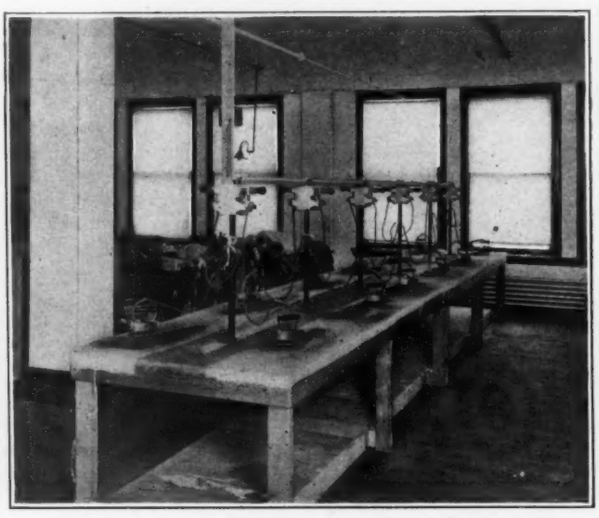
In commenting on the query whether the central-station salesman should be called upon to collect difficult accounts, a subject which was discussed at some length in these columns on Oct. 23, G. H. Smart, superintendent of lighting for the Knoxville (Tenn.) Railway & Light Company, writes as follows:

"It is my opinion that such a policy is not a good one. We find, on careful analysis of the time of our salesmen, that with the routine work that necessarily falls on them only about half of their time, at the most, is left for strictly new business. As you well know, the routine of signing up new customers, making transfers and handling things of that kind must be part of the work of the salesman, and unless there is a very large force of salesmen even this work cuts very seriously into the efforts for new business, both in lighting and in power, and gives them no time practically for doing anything with heating appliances or any other line outside of strictly new business."

Electric Irons Effect Better Working Conditions and Reduce Fire Risk

Electrically heated appliances are coming more and more into use in city shops and factories, not only because of their value from the standpoint of saving labor but also by reason of the resulting reduced fire risk, increased production, better products, and improved working conditions for the shop operatives. The average manufacturer is very willing to pay even a little more for electric operation if need be if these advantages of such operation are pointed out to him. The accompanying pictures show two typical installations in loft factories where articles of women's wear are made in New York City. These installations are served by the New York Edison Company. The shirtwaist factory, which operates eight electric irons, consumes about 2000 kw.-hr. per year, while the neckwear shop, shown in the other picture, consumes 3000 kw.-hr. per year. Pilot lamps give warning against leaving the irons accidentally in circuit.





ELECTRIC-IRON INSTALLATIONS IN TWO APPAREL FACTORIES, CONSUMING ABOUT 3000 KW.-HR. YEARLY

Technical Advance in Theory and Practice

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

EFFECT OF SLOT DESIGN ON IRON LOSS

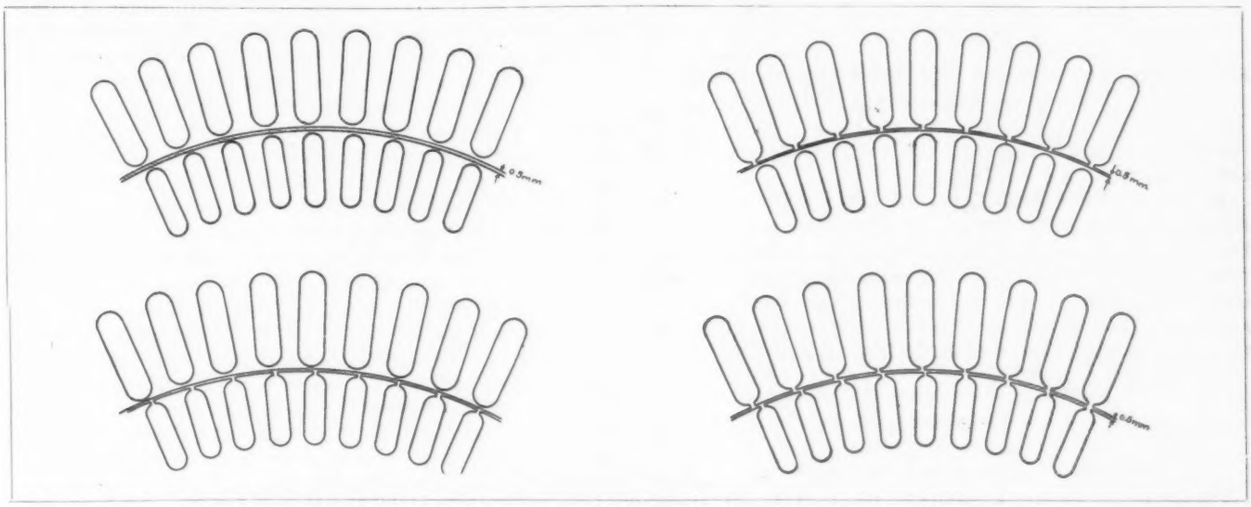
A Comparison of Iron Losses in Induction Motors Using Semi-Closed and Totally Closed Slots

BY E. B. MILLAR

The iron losses in three-phase induction motors are due to hysteresis and eddy currents caused by the alternations of the main flux in the magnetic material. The latter is augmented by filing or sawing the teeth, thereby joining the stampings together. Also the castings which form the supports, the end covers, etc., often have an induced flux, causing losses which should not be underestimated. There is, too, an additional pulsation tooth loss which is dependent upon the shape of the tooth and the relative number of teeth in the stator and the rotor. The determination of the relative value of these pulsation losses in the teeth was the object of the test described in what follows:

of closed and semi-closed slots, two 15-hp., three-phase, four-pole, fifty-cycle wound-rotor induction motors were built alike in every respect excepting the opening of the slots. The first one had totally closed slots and the second one had semi-closed slots with an opening of 1/16 in. sawed through the bridge of both stator and rotor slots respectively, as shown in Figs. 1 and 4.

The first motor, with slots arranged as in Fig. 1, was run light at normal frequency and variable voltage, the power input being measured in each case. This was repeated for the second motor, which had the slots arranged as shown in Fig. 4. The rotor from motor No. 2 was next placed in the stator of motor No. 1 and the same procedure followed, having the slots as shown in Fig. 3. Finally the rotor from No. 2 motor was placed in the stator of motor No. 1 and the same observations were made, the slots having the arrangement shown in Fig. 3.



FIGS. 1 TO 4—ARRANGEMENTS OF SLOTS SHOWING RESPECTIVELY (1) USE OF CLOSED STATOR AND CLOSED ROTOR SLOTS, (2) CLOSED STATOR AND OPEN ROTOR SLOTS, (3) OPEN STATOR AND CLOSED ROTOR SLOTS, (4) OPEN STATOR AND OPEN ROTOR SLOTS

The rotor teeth passing the stator teeth create a variation of the reluctance of the flux path and produce a variation or a pulsation of flux density in the teeth of the stator and the rotor.

As an extreme case the following may be cited: The stator has completely open slots and the rotor nearly open slots. The pitch of the stator slots is slightly less than one-half of that of the rotor slot pitch. As the rotor teeth pass the stator teeth a tooth and a slot are alternately opposite and the flux pulsates between a maximum value and almost zero. The frequency of this pulsation is one complete pulsation for every stator tooth. That is, the pulsation in the rotor teeth equals the number of stator teeth multiplied by the revolutions per second, and, in like manner, the pulsation in the stator teeth equals the number of rotor teeth multiplied by the revolutions per second.

It might be expected that the minimum amount of pulsation would take place in totally closed slots and increase as the slots were opened, first in the rotor and second in the stator. In order to determine this effect

From these values of total no-load power the friction and windage losses were deducted in the following manner: The above values were plotted volts against watts and the curves were extended to the abscissa or value of voltage equal to zero. The voltage being zero, the flux and the losses due to the flux reversal are also zero, and the power remaining is that due to the friction and windage.

For each of the four cases curves were replotted as shown in Fig. 5. The conditions of design of slots were as follows: (a) Stator slots closed, rotor slots closed; (b) stator slots closed, rotor slots opened; (c) stator slots opened, rotor slots closed; (d) stator slots opened, rotor slots opened.

The common origin was taken as the point where the power input curves produced cut the abscissa at zero voltage. The stator having sixty slots and the rotor sixty-one, the pulsation in the rotor teeth was 1500 per second and that in the stator teeth 1525 per second. The flux per pole at normal voltage is 9.05×10^5 maxwells, the iron loss for the semi-closed slots being ap-

proximately twice that of the totally closed slots. The greater portion of this extra loss is due to the increase in the magnitude of the pulsations, and a smaller portion is due to the opening of the teeth with a saw, thereby joining the edges of the teeth together and

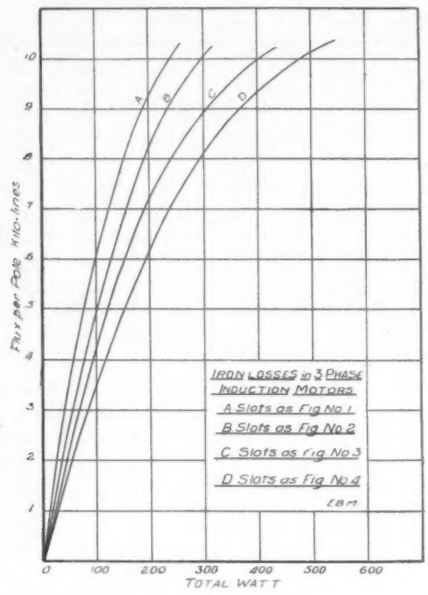


FIG. 5—IRON LOSSES FOR DIFFERENT COMBINATIONS OF SLOT DESIGNS

increasing the eddy-current losses in that portion of the teeth.

It should not, however, be concluded from the above that the motor which has the totally closed slots has the highest efficiency at normal full load and the semi-closed slots the lowest efficiency on account of the higher iron losses, for the closed slot design has a greater slot reactance than the semi-inclosed, and furthermore the semi-closed slots have a slightly higher gap density.

Melbourne, Australia.

Generators, Motors and Transformers

Distribution of Flux Around Direct-Current Armature.—BERNARD HAGUE AND FRANCIS F. H. SCHROEDER.—An experimental investigation in which the authors determined the distribution of flux not only around the core but also around the end connections and around any given coil in the armature. The mmf. due to the end connections of a double-layer winding produces poles on the overhang in just the same manner as those created upon the surface of the core by the mmf. of the conductors in the slots. The fact that the density of the flux dies off to zero as we approach the axial extremity of the winding shows that all the flux emanating from the armature sweeps over peripheral paths, and none passes over the end of the winding from the outside to the inside of the overhang or vice versa.—London *Electrician*, Oct. 1, 1915.

Generation, Transmission and Distribution

Water-Powers in Norway.—A long statistical article on the state and the hydroelectric problem in Norway. A map is given showing the state waterfalls and the private and municipal electric stations of Norway on the basis of a recent commission report. The state owns thirty-one falls, or systems of falls, with an aggregate of 148,950 effective horsepower without regulation and 743,480 effective horsepower after regulation. Since this list was compiled the state has acquired further falls, estimated to be capable of providing from 27,000 hp. to 29,000 hp. after regulation. One of the main objects of the state's purchase of waterfalls has been that the community should be adequately supplied with electric power. For this purpose the royal commission has investigated the probable requirements in electric energy, just as has recently been done in Holland. Another question the commission has gone into with considerable care is that of electric heating and cooking, and exhaustive reports have been obtained from various quarters, electric heating, as a matter of fact, having been seriously tried in a good many places in Norway. In calculating the whole country's probable requirements of electricity, the commission fixes them at one-fifth of an electric horsepower per inhabitant. This is exclusive of the large quantities of electric energy absorbed by the chemical industry and irrespective of requirements for heating. Twenty town electric stations, supplying the electric-energy requirements of 574,000 inhabitants, had a maximum load of about 33,000 kw. For lighting and the small industries there was installed about 67,000 kw., the greatest load being 57 kw. per 1000 inhabitants. By about doubling this consumption and putting it at 100 kw. per 1000 inhabitants, the commission arrives at a demand of 70,000 kw., or 95,000 hp., for the towns. An objection might be raised against the multiplication of municipal electric stations, namely, that they would interfere with possible future action by the state to take over the entire national supply of electricity. The commission, however, does not consider that this objection holds good, for even if the municipal central stations were built according to systems which were at variance among themselves and with the system which the state ultimately might see fit to adopt, there probably would be nothing to prevent these municipal stations from acting as receivers and distributers of the state energy. Nor is there any reason of fear that all these local systems would clash with a state all-country system, inasmuch as the state always will have it in its power to legislate according to its wishes. The commission holds that the state ought, as soon as possible, to set about the exploitation of its waterfalls, and that the best solution will be for the state itself to undertake the exploitation, but that this work should not be done all at once.—London *Engineering*, Oct. 8, 1915.

Installations, Systems and Appliances

The War and the British Electricity Supply Industry.—An article on the effect of enlistment and munition manufacture on the electricity works of a large industrial district. The author describes the way in which the various problems were solved with satisfactory results to all concerned. He also discusses the best policy to pursue after the war in order that the extensions now made for temporary purposes may be put to good use. "Previous to the war trade was booming and would no doubt have remained good for many years. As an industry the central stations were sharing in the prosperity, and had the war not happened it is quite probable that the extensions of plant which we have now made in, say, ten months would have had to have been made in the course of fifteen months at the outside. It is at this point, however, that the cases cease to run parallel. The plant of which the writer has charge has been increased by about 30 per cent, and further large increases are necessary, which in the matter of capital cost will be more expensive than the plant installed two years ago. Had the war not occurred, the whole of the capital laid out in these extensions would have been kept working year after year on a steadily increasing load and have thus been able to earn a fair rate of interest

on the outlay. Now we are faced with the probability of this enormous addition to our capital expenditure being unable to earn its standing charges owing to the plant being idle through bad trade after the war. When peace is restored we shall first require to restock our arsenals with the safe minimum amount of war material. As we are increasing the factories at which such material can be made, it follows that this restocking cannot take long, and then will come a heavy slump in trade unless we act now. When the restocking is complete there will be literally hundreds of motors and thousands of machine tools thrown on the market. At the same time northeastern France, Belgium, Russia and Serbia will need their homes rebuilt and their factories put in a position to supply their needs once again. They will, however, lack the capital necessary to carry out this work. Will it not pay us to arrange that this capital shall be found by the British Empire, and that our munition factories shall be swung over to industrial work quicker than they were swung from their previous work to that of munition making? . . . If we do not come forward and find the capital to rebuild the towns of our allies, then America will do so, and will not only capture the immediate trade by doing so, but, by the very act of thus helping those countries, will have them in financial bondage to her for many years." —London *Elec. Eng'ing*, Oct. 7, 1915.

Electrolytic Lightning Arrester.—C. C. GARRARD.—In a continuation of his long illustrated serial on apparatus for protecting electrical machinery against abnormal electrical conditions, the author takes up the electrolytic lightning arrester and discusses its construction and operation. He deals with the charging of aluminum lightning arresters and the value of the charging resistance for the arrester.—London *Electrician*, Sept. 24, 1915.

Quick Regulator.—G. E. GRAU.—An illustrated translation in abstract of his recent German paper on the Siemens-Schuckert quick regulator.—London *Electrician*, Sept. 24, 1915.

Wires, Wiring and Conduits

Electric Strength of Insulating Materials Under Mechanical Pressure.—F. KOCK.—An English translation in abstract of his recent German paper on the effect of an increase of pressure on the insulating strength of various insulating materials.—London *Electrician*, Oct. 8, 1915.

Electrophysics and Magnetism

Life of Radioactive Substances and the Range of the Rays Emitted.—F. A. LINDEMANN.—It is shown that the well-known formula connecting the life and the range of radioactive elements may be developed from a few simple and plausible assumptions. It follows that the explosion of an atom necessitates the fortuitous coincidence of some eighty independent events. A calculation of the radius of the nucleus of the radioactive atom of radium gives a value in fair agreement with expected dimensions.—*Philos. Magazine*, October, 1915.

Electrochemistry and Batteries

Electrochemistry at the Pacific Coast.—J. W. BECKMAN.—A review of electrochemical possibilities at the Pacific Coast. The author reviews conditions of labor, refractories, reducing materials, flux materials, metal ores, possible industries, markets and financial conditions. He thinks that the caustic-soda and bleaching-powder industry is the most promising at the present time for an early development. Potassium-chlorate manufacture is another industry which should have special possibilities here, with the raw materials necessary for it produced on the coast. The demand for calcium carbide in South America is great, as it is also in the mining districts of the western part of the United States. The raw materials are obtainable and the manufacture of carbide should become a flourishing industry. Nitrogen-fixation industries seek very cheap power, and such power is available as well as a very large market for the product. The iron and steel industry has great possibilities on the Pacific Coast, and although the present electric shaft-furnace plant in northern California has not been an entire success, there is every reason to believe that success would be won if past experience as well as present practice in Sweden were utilized, together with the application of new principles using oil, or oil and charcoal, as reducing agents. The demand for high-grade steel castings, produced by means of the electric furnace, is large. The Pacific Coast should logically be the world's distributing center for cyanide used in gold extraction. With raw materials suitable for the manufacture of this salt available, electric power and the market all close at hand, such an industry should flourish. Aluminum manufacture, lead reduction, zinc production and the electrolytic refining of copper are other electrochemical industries which should be developed on the Pacific Coast.—*Journal Electricity, Power and Gas*, Sept. 18, 1915.

Sewage Disposal.—J. C. OLSEN.—The first part of an illustrated paper on the Landreth electrolytic method of sewage disposal, which has been in continuous use at Elmhurst, New York City, since April, 750,000 gal. of sewage being treated daily. The novel features of the process are that lime is used together with electrolysis for the treatment of sewage and that a much smaller quantity of electricity per gallon is used than in other processes. Electricity alone has been used before as well as lime alone, but the combination of these two agents accomplishes what neither of them alone can effect. The Landreth process also employs a very thorough system of agitation. The article is to be concluded.—*Met. and Chem. Eng'ing*, Oct. 15, 1915.

Units, Measurements and Instruments

A Simple Resonance Experiment.—O. STEELS.—A description of a simple and striking resonance experiment for lecture purposes requiring the use of ordinary apparatus only. A little magnet *N*—for instance, one of those little models which are used for tracing the force lines of magnetic fields—is placed in the neighborhood of a coil *B* connected to the rings *C* of a bipolar commutator *D* running at a constant velocity (Fig. 1). Close to the magnet we place an electromagnet—an iron rod *D* surrounded by a coil *A*—connected to a battery, the current being regulated by the rheostat *R* and read on the ammeter *A*. If we consider either the positions

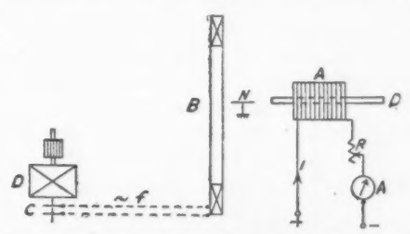


FIG. 1—ARRANGEMENT OF APPARATUS USED IN RESONANCE EXPERIMENTS

of the electromagnet *A* shown in Fig. 2 or in Fig. 3, we observe that the needle *N* is at rest when the current *I* is cut off. If we increase this current, we see the needle starting a periodical vibration the amplitude of which rises with the magnitude of the current *I*, passes through a maximum, and decreases till, for a sufficiently large current *I*, the needle is again at rest. We may

proceed in another way. Taking a suitable value for the current I which we maintain constant, we slowly remove the iron bar D from the electromagnet, and we observe, as above, the same variable periodic movement of the magnetic needle, which illustrates in a striking manner

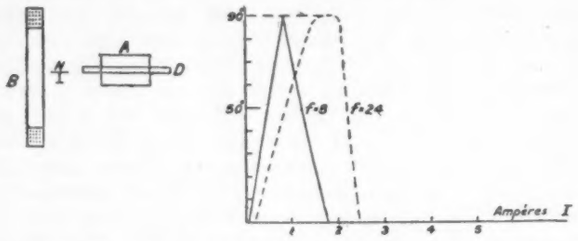


FIG. 2—RESONANCE FOR POSITION ILLUSTRATED

the phenomena known under the general name of resonance. f is the frequency, and it is seen that the resonance curves shift to the right when the frequency increases and that at the same time the resonance curve flattens. This experimental arrangement is a synchronous single-phase motor with variable reluctance and reduced to its theoretical simplicity, and it may be used to demonstrate Blondel's theory of this motor type. —*Philos. Magazine,* October, 1915.

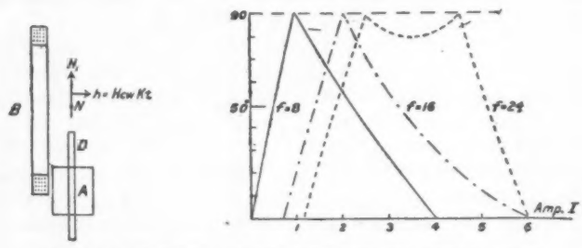


FIG. 3—EFFECT OF FREQUENCY ON RESONANCE

Telegraphy, Telephony and Signals

Loaded Telephone Lines.—E. E. Detritsch.—An account of a comparative test of ordinary telephone lines and cables loaded with Pupin coils and also continuously loaded lines (Krarup system). The results of tests are first given for ordinary telephone lines and cables, then for Pupin overhead lines and cables, and finally for complex lines. Krarup cables or ordinary telephone cables can be connected to uncovered ordinary telephone wires, without disturbance of the various electric factors. On the other hand, connection of Pupin loaded telephone lines to Krarup cables, or of Pupin cables to ordinary telephone lines, must be avoided. Pupin lines should always be used for direct long-distance lines without intermediate stations—i.e., between large cities having direct telephone connection. The connection of cables of low characteristic with Pupinized lines should be avoided and the line should be as uniform in character as regards thickness and material of wires as possible. It was finally attempted to eliminate the bad effects in reflection losses noticed when connecting Pupinized uncovered lines to Krarup cables by various means. It was found possible to load cables having fairly heavy conductors with self-inductors in such a way that they acquired a characteristic which made them suitable for connection to Pupin lines as well as to ordinary lines. The coils need not be built in at special points, although a certain systematic construction is advisable. There are no objections to loading Krarup cables with Pupin coils. The Krarup cables have an artificially increased self-inductance, and it would be sufficient to insert every 3 miles to 3.5 miles a Pupin coil of 0.2 henry inductance in order to raise the characteristic of the cable from 400 to 800 or 900 and decrease the damping effect from $\beta = 0.0140$ to 0.0070 or 0.0080. The cost of Pupinization would be about one-third of the cost of copper conductors used in cables without the iron winding.—London *Electrician,* Sept. 24, 1915.

Book Reviews

The Electric Railway. By A. Morris Buck. New York: McGraw-Hill Book Company, Inc. 390 pages, 192 illus. Price, $3.

With the exception of thirty-nine pages on cars, fourteen pages on electric locomotives and nine pages on track, the 390 pages of this book deal with the electrical requirements of urban and suburban transportation. Little except in a general way is given on operating costs, maintenance of equipment and systems, and nothing on handling cars when not in service. If these points can be overlooked in a textbook designed for the operating engineer as well as the student, and purporting to cover a field such as that coming under the heading of the "electric railway," then the book is well written. It discusses in a general way the requirements and performance of motors, their control, energy required for car movement, braking, signaling and like operations. Power-station requirements, transmission lines, substations and distribution circuits are briefly treated. More attention is given to the last two than the first two subjects, the latter being disposed of in eleven pages. "Engineering Preliminaries" is the title of the last chapter of the book, which includes twelve pages. In this space the author discusses railway location, future requirements, number, size and types of cars, schedule and maximum speeds, operating expenses, construction costs, steam-railroad electrification and choice of a system.

Steam-Boiler Economy. By William Kent. New York: John Wiley & Sons, Inc. 718 pages, 287 illus. Price, $4.50.

Back in 1901 the first edition of Professor Kent's book on "Steam-Boiler Economy" was published, and at that time it was the last word on the subject of steam-boiler operation. The second edition, revised and considerably enlarged, now appears, and it is interesting to note the advance in practice during these fourteen years and the contributing elements as recorded by the author in the preface to this edition. He includes as improvements in operating practice the use of much larger boilers, larger combustion chambers, rapid driving, coal and ash-handling machinery, mechanical stokers, gas analysis, superheaters, draft gages, electric pyrometers, purchase of coal under specification analysis and tests, treatment of water, better construction and higher factors of safety, recording and plotting of boiler performance, and bonus and premium systems of payment of wages. The improvements secured by these means and devices are discussed in this new edition, so that the work is all that the first excellent edition was with a great deal of useful and practical information added. Two new chapters appear, one on boiler design and construction and one on boiler attachments and boiler-room appliances. New tables of analyses and heating values of coals are also included. The present work as a treatise on steam boilers by such a capable and well-known author is a valuable addition to any private library, however many other books on the subject may be possessed.

Paul M. Lincoln, who retired Aug. 1 as president of the American Institute of Electrical Engineers, has resigned as general engineer for the Westinghouse Electric & Manufacturing Company and, it is understood, will enter the manufacturing business to develop some recent inventions.

C. F. Nagle, superintendent of the Citizens' Electric Illuminating Company of Pittston, Pa., was accidentally shot and severely wounded by a hunter who was shooting wild ducks near the company's plant. Mr. Nagle was supervising the performance of some work at the time of the accident.

Charles R. Underhill, electrical engineer for the Acme Wire Company, New Haven, Conn., lectured on electromagnets at the University of Michigan, Ann Arbor, Oct. 14; the University of Minnesota, Minneapolis, Oct. 18; Iowa State College, Ames, Oct. 20, and the University of Wisconsin, Madison, Oct. 22.

S. R. Bertron, Jr., has been appointed general manager of the Houston Lighting & Power Company, Houston, Tex., succeeding D. A. Hegarty, who has resigned in order to become president of the Texas Southern Electric Company. Mr. Bertron has been general manager of the Consumers' Light & Power Company of New Orleans, La.

Dr. Willis R. Whitney, who was appointed to represent the American Chemical Society on the Naval Advisory Board, is director of the research laboratory of the General Electric Company at Schenectady, N. Y. Dr. Whitney was graduated in 1890 from the Massachusetts Institute of Technology and served as an assistant professor of chemistry in that institution. He later went to Leipsic, Germany, where the degree of Doctor of Philosophy was conferred upon him in 1894. Upon his return to America he was appointed by the General Electric Company director of its research laboratory at Schenectady. Among the many important developments and inventions made in this laboratory under the direction of Dr. Whitney have been the development of the drawn-wire tungsten filament and the gas-filled lamp. Dr. Whitney's individual investigations have been confined largely to studies of the corrosion of iron and the properties of colloidal solutions and suspensions.

W. R. WHITNEY

Men of the Industry

Changes in Personnel and Position— Biographical Notes

D. A. Hegarty has resigned as general manager of the Houston (Tex.) Lighting & Power Company to become president of the newly formed Texas Southern Electric Company, an organization of Texas utility companies having its headquarters in Houston. Mr. Hegarty, after leaving the University of Pennsylvania, was employed in the engineering department of the Pennsylvania Railroad, but soon entered the electric-railway field as an associate of A. Langstaff Johnston, then in charge of the electrification of Philadelphia's street railways. Following the completion of this work Mr. Hegarty was connected in an official capacity with the Hestonville, Mantua & Fairmount Railway Company, the Norfolk (Va.) Railway Company, and the Railway Companies General. For several years he was general manager of the Little Rock Railway & Electric Company, and later he was manager of the lighting department of the New Orleans Railway & Light Company. Mr. Hegarty has been general manager of the Houston Lighting & Power Company since February, 1914. He is a former president of the traffic and transportation branch of the American Electric Railway Association.

D. A. HEGARTY

J. O. Montignani has been appointed engineer in charge of electrical distribution for the Rochester (N. Y.) Railway & Light Company and will be attached to the engineering department of the company. Mr. Montignani was formerly attached to the operating department of the Rochester organization, but since June, 1914, he has been inspecting engineer for the western half of New York State for the Utilities Mutual Insurance Company.

Robert W. Kiple, assistant manager and purchasing agent of the Pennsylvania Utilities Company, Easton, Pa., has resigned this position to become commercial manager of the United Gas & Engineering Corporation at Harrisburg, Pa., the change becoming effective Nov. 1. Mr. Kiple has been associated with the electrical industry in New York State and eastern Pennsylvania since 1893. In 1904 he became manager of the Wayne County Electric Company, with headquarters at Lyons, N. Y., and in 1911 he joined the Meikelham & Dinsmore forces in charge of the commercial department of the Sayre (Pa.) Electric Company. He was afterward promoted to the position of general manager of the Pennsylvania Utilities Company, operating from Easton, Pa., in which capacity he remained until June, 1915, when the properties were acquired by W. S. Barstow & Company.

Obituary

Capt. George C. Cartwright, who was killed in France while gallantly rallying his men, had been a prominent figure in electrical export circles. He represented the General Electric Company in Japan and Brazil for several years prior to 1911, and since that time had been connected with the F. S. Pearson Engineering Corporation in charge of engineering and purchasing for the London office. Captain Cartwright was also associated with the Barcelona (Spain) power-transmission project.

E. S. Marlow, manager of the commercial department of the Potomac Electric Power Company, Washington, D. C., died Oct. 25 after an illness of nine months. Mr. Marlow, who was the subject of an extended biographical sketch in these columns Oct. 9, had spent his entire career in central-station work in Washington and in recent years had been extremely active in the interests of the Illuminating Engineering Society and the Electric Vehicle Association, becoming the first chairman of the latter's Washington section.

E. S. MARLOW

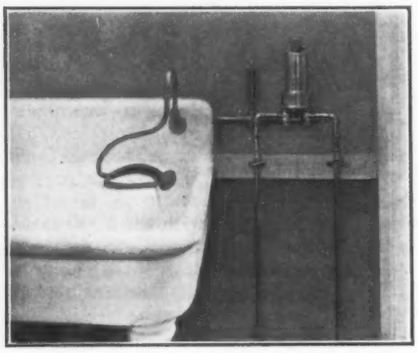
New Apparatus and Appliances

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Industry

Electricity in the Modern Nursery

Applications of electricity in the model nursery were displayed at the recent Electrical Show in New York. There were shown appliances for bathing the baby according to the newest methods, an electrical crib blanket, heating pads, adjustable lamps, radiators, bottle warmers, an incubator and sterilizer, and many fascinating electrical toys.

In the electrical nursery the familiar bathtub and convenient elbow "thermometer" have been supplanted by the modern and approved sanitary device illustrated at the right. Neither cloth nor sponge is used, but in their place a spraying outfit is employed. The tubing is attached to a faucet piped to a "mixer" which is designed to permit the regulation of the temperature of the electrically heated water, and a thermometer at the side of the "mixer" indicates when the desired temperature is reached. The spray is then played on the infant, who is held in position on a rubber pad placed on the marble slab. This new bathing apparatus is being used for small children in the leading hospitals and day nurseries and in some private families.



THE ELECTRICALLY HEATED SPRAY WHICH REPLACES THE CLOTH OR SPONGE

In the crib the much desired even, dependable warmth for the little sleeper is maintained by the use of an electric blanket, and where additional warmth is necessary, as in the case of the newborn infant, the heating pad makes a worthy substitute for the hot-water bag.

An adjustable lamp that lends itself readily to clamping on the crib can be so arranged as to light the nursery and yet to prevent the rays of the lamp falling on the child's face. An artistic radiator of the luminous type furnishes cheery auxiliary heat for the room and is most serviceable during the seasons and hours when the household furnace is not doing full duty. The radiator is also very useful in supplying a mild warmth to the garments to be put on the baby after its bath.

The electric bottle-warmer makes unnecessary a cheerless trip to the kitchen at midnight to heat the food. The incubator and the pasteurizer have long justified their existence, and the latest models of this apparatus were shown.

For the growing child there were also some wonderful electric toys that would delight the heart of any youngster—a wireless outfit, all kinds of small motors, a generator "that sends pins-and-needles through your hands," electric games, electric tops, a jig-saw, a radiopticon, and—the center of childish as well as adult attention—a miniature city with tracks laid for a little electric train of cars and a switching device that lighted up the make-believe houses at the touch of a button.

ELECTRIC COMFORTS FOR THE TINY SLEEPER'S CRIB ON COOL NIGHTS

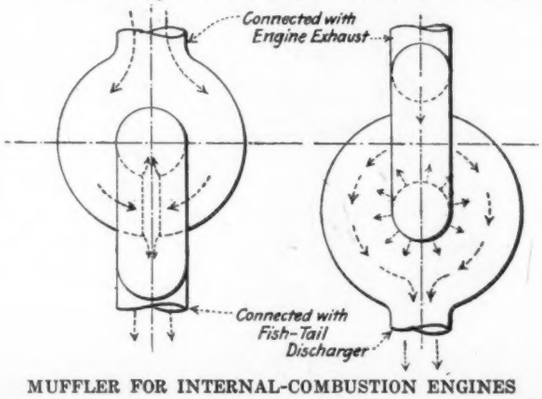
Decorative China Electric Percolators

China percolators of beautiful design and in various artistic colors are being placed on the market by the Rochester Stamping Company of Rochester, N. Y., some of the types being provided with attractive decorations in nickel. In Fig. 1 is shown a percolator with nickel appliqué decorations on "Brown Betty" china. The percolator is equipped with a "Royal Rochester" built-in unit, which consists of resistance wire wound on a mica core held securely between two half cylinders of brass and insulated from them by mica, the whole being incased in a metal cylinder, which projects through the bottom of the container directly into the water. With this unit, the manufacturer declares, instant percolation is possible. In Fig. 2 is shown another percolator of Lenox china. Decorations are of Colonial copper or nickeled copper. Percolation is obtained by the same type of built-in heating units described above.

FIGS. 1 AND 2—DECORATIVE CHINA PERCOLATORS

Exhaust Silencer Operating on Principle of Neutralizing Sounds

The principle that two similar synchronous sound vibrations propagated in opposing directions will neutralize each other and result in silence has been applied commercially to eliminate the sound ordinarily

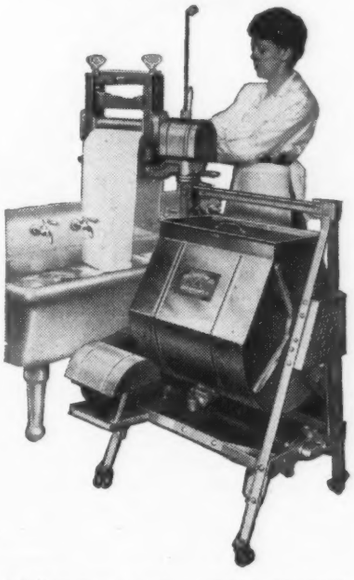


MUFFLER FOR INTERNAL-COMBUSTION ENGINES

caused by an unmuffled exhaust from an internal-combustion engine. In general this noise eliminator, as shown by the accompanying diagram, consists merely of two branches from the exhaust pipe curved so their outlets face each other. To prevent back pressure the faces of the outlets are separated by a distance equal to the radius of the main exhaust pipe, thus making the peripheral outlet area equal to the cross-sectional area of the main exhaust pipe. Another detail of construction is that a torus-shaped inclosure surrounds the peripheral exhaust outlet and discharges into a fishtail-shaped outlet, which also has a cross-sectional area equal to that of the main exhaust pipe. This combination makes a compact unit which disposes of the exhaust gases in one direction. Expansion of gases, it may be pointed out, is not employed to silence the exhaust. As there are no baffles or partitions in the device, there is little chance of grease and soot collecting in the noise eliminator—thus minimizing the possibility of back pressure, incomplete discharge of the waste gases from the cylinders, and muffler explosions. These devices which can be furnished in sizes suitable for the largest engines, are being manufactured by the Nolen Accessories Company, 2 West 140th Street, New York City.

Electric Oscillating Washer

The motor-driven washing machine shown herewith operates on the oscillating principle, the action causing hot water, steam and suds to be forced through the clothes. Excepting the wringer, the machine is all metal in construction. This "Apex Junior" machine, as it is called, is designed to wash sixteen shirts, five sheets or the equivalent at one time. It is operated by a ⅛-hp. motor which causes the tub to oscillate thirty-four times a minute. The wringer is of the swinging type, operating in any of four positions, and is provided with an emergency release device. The machine is practically noiseless in operation, and every gearing and moving part is fully protected by guards to obviate accidents. The washer takes up a space 27 in. by 28 in. and is 52 in. high. Its weight complete is 250 lb. The tub is of galvanized steel or copper which is tinned inside. The machine is mounted on revolving casters so that it can be readily moved from place to place. The washer is being placed on the market by the Apex Appliance Company, 3223 West Thirtieth Street, Chicago, Ill.



ALL-METAL OSCILLATING WASHER

Electric Percolator with Fusible Nut

A percolator just brought out by the Simplex Electric Heating Company, Cambridge, Mass., is of nickel-plated copper and has an aluminum valve which can be easily removed for cleaning purposes. It is designed to circulate a large volume of water continuously through the ground coffee in the "basket." The result, the manufacturer asserts, is clear, transparent coffee, free from cloudiness and grounds. An automatic cut-out is provided for preventing injury from overheating. By means of this device, if the utensil is accidentally allowed to "boil dry" and overheat, the circuit is opened, thereby preventing injury to either the heater or the utensil. In its operation the excess of heat partly melts a nut of soft metal, which drops off and instantly opens the circuit. An extra fusible nut is supplied with each appliance and can be placed in position without a screwdriver and with little inconvenience. The percolator is equipped with a Hubbell plug and a Simplex quick-detachable connector. The connector attaches or releases the cord without friction by pressing a button. The No. 1350 coffee-pot percolator, as it is called, has a capacity of 2.5 pints and is rated at 360 watts.

ELECTRIC PERCOLATOR WITH REMOVABLE ALUMINUM VALVE

Sewing-Machine Motor

A small motor which is designed to be attached to any type of sewing machine is shown herewith. The sewing machine is operated by placing the pulley of the motor against the handwheel, as shown in Fig. 1. No clamps or screws are required. To change from ordinary foot operation it is only necessary to slip the belt off the flywheel. The motor operates on either alternating current or direct current. It is equipped with a

FIG. 1—MOTOR WITH PULLEY AGAINST HAND-WHEEL OF SEWING MACHINE

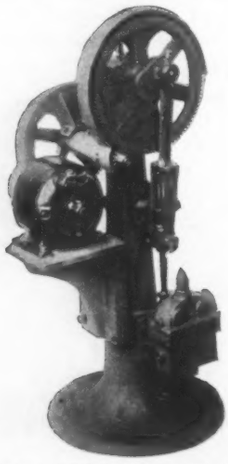
treadle-operated speed regulator, which is placed on the floor under the machine and can be operated by a slight pressure of the foot. Six steps of resistance are provided, making it possible to operate the machine at any desired speed up to 800 stitches a minute. The

FIG. 2—TREADLE-OPERATED SPEED REGULATOR

"Dumore" sewing-machine motor, as it is called, is being placed on the market by the Wisconsin Electric Company, Racine, Wis.

Electric House Pump

A complete motor-driven house pump of sturdy construction which is well adapted for use on farms and in suburban residences is shown herewith. It may be employed to pump water from wells, cisterns, springs or similar sources of water supply and is designed to pump the water to a height of 100 ft. or against a pressure of 50 lb. It can, therefore, be used in connection with either open attic tanks or basement pressure tanks. The gears are machine-cut and shielded. Brass valves, cylinder and piston rod, and large, well-lubricated bearings are provided, insuring long life. A cloth-covered driving piston is employed to minimize noise. The

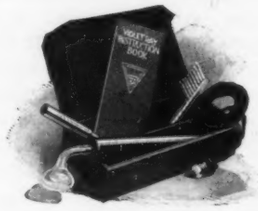


SELF-CONTAINED MOTOR-DRIVEN HOUSE PUMP

motor, which is of Westinghouse make, is mounted on the pump as shown and is of the single-phase clutch type, being rated at 1/6 hp. when operating at a speed of 1700 r.p.m. It is designed to start the pump at full load. The pump is entirely self-contained and requires no special foundation. It is being made by the Hill Manufacturing Company, Anderson, Ind.

Small High-Frequency Generator

A "Baby Violet" high-frequency generator, as it is called, light in weight, has been developed, particularly for home use, by the Sterling Corporation, 1276 West Third Street, Cleveland, Ohio. Therapeutically it is designed for treating numerous diseases and various body affections. The device weighs only 20 oz. and



LIGHT-WEIGHT HIGH-FREQUENCY GENERATOR WITH ATTACHMENTS

measures 10 in. long and 1.5 in. in diameter. It is inclosed in a black leatherette carrying case, having a purple velveteen lining with clips for several attachments. A 6-ft. cord and a screw plug are also provided for attaching the device to an ordinary lighting socket.

Toy Transformer with Automatic Circuit-Breaker

Because of the fact that toy transformers are usually employed by inexperienced operators who frequently, intentionally or otherwise, overload the transformer so as to affect seriously the insulation of the winding and pave the way for a subsequent break-down, the Thorardson Electric Manufacturing Company, 501 South Jefferson Street, Chicago, Ill., has brought out a toy transformer equipped with an automatic circuit-breaker on the primary side. One of the most frequent causes for breakdown of transformers has been the bridging of the rails of miniature electric railroad outfits when the trains have been derailed, thus short-circuiting the secondaries of the transformers and causing complete burn-outs if the train is left in this derailed position for any length of time. With the circuit-breaker, in the primary side of the transformer, however, the hazard is eliminated. The transformer is equipped with a voltage regulator by means of which the secondary

TOY TRANSFORMER WITH CIRCUIT-BREAKER IN PRIMARY SIDE AND VOLTAGE REGULATOR

voltage can be varied in steps of 1 volt from zero to the maximum range of the secondary voltage. The device is inclosed in a steel shell and the windings are embedded in an insulating compound, making them impervious to moisture and cementing the entire winding into one solid block. Transformers of the type described are being made to operate on from 100 volts to 120 volts and

from 60 cycles to 133 cycles. Plugs and flexible attachment cords are provided for connecting the transformer to the line circuit and to the toys it supplies.

Utility Motor

The Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York, has recently placed on the market the 1/16-hp. utility motor shown herewith. The motor operates on either alternating current or direct current at 110 volts and is designed and wound for speeds required in polishing and grinding. It may be utilized for sharpening knives, for polishing silver and other metals in the household and elsewhere, and for numerous other purposes which may suggest themselves. The following attachments are provided: 8-ft. flexible cord and plug, one 2.5-in. emery wheel for grinding, one 2.5-in. muslin wheel for smoothing, one 2.5-in. canton-flannel wheel for polishing, one felt cone, one stick of "tripoli" for smoothing, and one stick of rouge for

ELECTRIC-UTILITY MOTOR WITH VARIOUS ATTACHMENTS

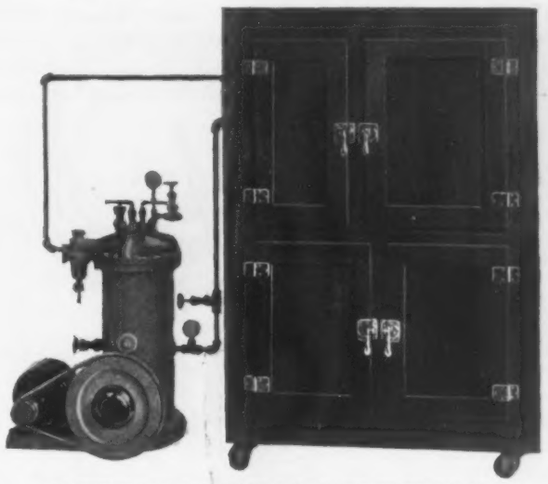
polishing. The motor may also be employed with a flexible shaft for polishing metal parts on automobiles, railings, signs and many other places. A variety of devices may be also driven from the 1-in. pulley when coupled with a 0.25-in. round belt. A two-speed starting switch is provided in the base. The machine is equipped with a handle as shown in the accompanying illustration for carrying it from place to place. The finish is black japan with brass trimmings. The entire outfit weighs 13.5 lb.

Electrically Operated Refrigerator for Household Service

Among the many electric appliances developed for use in the home the motor-operated refrigerator is one which will prove of great interest to the housewife because of the elimination of the iceman's visits and the improvement in sanitary conditions in the icebox resulting from direct refrigeration.

In the accompanying illustration is shown a motor-driven refrigerating apparatus of the ammonia-compression type. The entire system with the exception of the expansion coil is a single self-contained unit. The condenser shell is superimposed upon the compressor cylinder, and the cylinder discharges directly into this shell without any intermediate piping. Inside of the shell is placed a pipe coil which carries the cooling water. The bottom of the shell forms the liquid ammonia receiver and the oil trap.

Since all of the high-pressure ammonia lines are confined within the machine itself, there are no outside joints which carry high-pressure ammonia, and the



ELECTRIC REFRIGERATOR FOR HOUSEHOLD USE

danger from leaks, it is declared, has been practically eliminated. Another feature which adds to the compactness and safety of the outfit, the manufacturer points out, is the fact that the compressor is valveless. The ammonia gas is taken into the cylinder through a series of ports and is ejected from the cylinder through a safety head which covers the entire cylinder top. In this way it is not necessary to make any fine adjustments for clearance as the piston may actually travel past the end of the cylinder without damaging the machine. The apparatus is being made by the Germania Refrigeration & Machinery Company, Belleville, Ill., and is operated by a 0.5-hp. motor made by the Robbins & Myers Company, Springfield, Ohio. The outfit has a refrigerating capacity equivalent to the melting of 325 lb. of ice per twenty-four hours.

Electric Boudoir Set

An interesting development for feminine use just brought out by the Hotpoint Electric Heating Company, Ontario, Cal., for the holiday season is the boudoir set shown herewith. This device commends itself as a utilitarian gift, and as a household appliance it will foster the interest of the recipient in electric devices. The set

ELECTRIC SET FOR USE IN THE BOUDOIR

can be operated from an ordinary lighting socket and consists essentially of a 3-lb. iron with beveled-edge sole-plate, permitting the operator to iron under and between ruffles, plaits, tucks, etc., and an inverting stand for converting the iron into a small electric stove for light cooking and for heating and boiling water. A hood or cover can be placed over the sole-plate and utilized as a

holder for heating curling-tongs or as a Marcel waver. A pair of curling tongs and a cord and small switch plug accompany the set. The entire outfit telescopes and fits into a felt bag. The set is finished in polished nickel.

Vacuum Cleaner with Adjustable Nozzle

The Regina Company, 47 West Thirty-fourth Street, New York, has just brought out a portable vacuum cleaner which is an improved machine and is equipped with an adjustable revolving brush operating inside the

FIG. 1—PORTABLE VACUUM CLEANER WITH HORIZONTAL MOTOR

nozzle. The movement of the cleaner over the carpet operates the brush through a set of gears inclosed in a dustproof gear case, in a direction opposite to that in which the cleaner itself is moved, thus loosening all

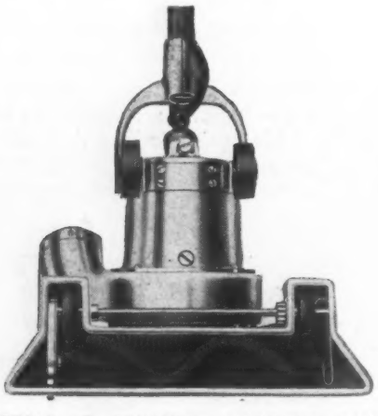


FIG. 2—BOTTOM OF CLEANER, SHOWING CONSTRUCTION AND MOUNTING OF BRUSH

threads, lint, etc., it is declared, so that the suction will cause them to be drawn up into the bag. The manufacturer also points out that the brush tends to raise the nap of the carpet, allowing the current of air to penetrate to the bottom of the fabric. The brush is so mounted that it automatically adjusts itself to any kind of rug or carpet. Aluminum is largely used in the construction of the machine. The nozzle is 12 in. wide and is so designed that cleaning can be effectively done, it is asserted, in corners, close to baseboards, and also on stair carpets. The extreme height of the cleaner above the floor is 6⅞ in., so that it can readily be used under furniture, beds, etc. All parts which need lubricating are oiled through self-feeding oil cups, which require refilling only at intervals of several months. The motor is controlled by a switch at the upper end of the handle. An adjusting lever is provided to regulate the position of the nozzle. The cleaner is driven by a General Electric motor, which operates on either direct current or alternating current at from 100 volts to 120 volts.

Mica Products

The Carolina Mineral Company, Penland, Mitchell County, N. C., is mining large quantities of mica and is cutting and stamping the material in various kinds of pieces such as washers, disks, etc., for use with magnetos, rheostats and other electrical apparatus. Thousands of pounds of high-grade mica, according to W. E. Dibbel, president of the company, is being produced which in quality is equal to the best India mica. Recently the company has doubled its force in its manufacturing department in order to do special work that was previously done in Germany.

Electric Ovens for the Navy's Newest Battleships

Four electric ovens for the two new United States battleships California and Arizona have been completed by the Hughes Electric Heating Company of Chicago, Ill. The ovens operate at 230 volts and are arranged to work at three temperatures, the heating elements consuming 14 kw., 7 kw. and 3.5 kw. at the high, medium and low temperatures respectively. Each oven measures over all 48 in. in width by 44 in. in depth by 72 in. in height. As is shown in the illustration herewith, the oven interior is divided into six compartments large enough for each to hold two standard navy bread pans measuring 26 in. by 17 in. by 3.5 in. The walls, bottom and top of the ovens are insulated with 3 in. of mineral wool.

The heating elements, which are of the standard Hughes type built in special shape, are arranged to give even heat distribution throughout the oven. The units

ELECTRIC OVENS FOR THE BATTLESHIPS CALIFORNIA AND ARIZONA

set into the two lower shelves are of the highest wattage; those in the next four shelves are alike but of lower wattage than the two lower ones, while the one at the extreme top of the oven is of the lowest wattage. Each element measures 24 in. in depth by 34 in. in width and each is easily removable.

Control is effected through an external panelboard,

and it is possible, with the elements operating at full rating, to bring the interior of the oven to a temperature of 500 deg. Fahr. in 45 minutes. In the acceptance test conducted by a naval officer the ovens were operated empty at full rating for five hours continuously.

40-Watt and 60-Watt Gas-Filled Incandescent Lamps

The Lux Manufacturing Company, Hoboken, N. J., has just placed on the market a 40-watt and a 60-watt argon-filled incandescent lamp. These units are said to be the smallest of their type yet developed. Both lamps

60-WATT ARGON-FILLED TUNGSTEN LAMP

give a brilliant white light, the 60-watt unit producing about 75 cp. and the 40-watt unit about 45 cp. The larger lamp has been designed to take the place of the ordinary 100-watt tungsten lamp and the 40-watt unit that of the 60-watt tungsten lamp.

Porcelain Receptacle

According to the E. H. Freeman Electric Company, 803 East State Street, Trenton, N. J., which is the manufacturer of the porcelain receptacle shown herewith, the device is easy to wire up and, after connections have

PORCELAIN RECEPTACLE WITH COVER OVER BASE

been made, the cover can be placed over the base and the receptacle put in position by a slight turn. Two set screws are inserted from the outside and firmly lock the cover in place. The porcelain is of attractive design, and when in position the receptacle adds to the appearance of the wiring installation.

Electrically Heated Embossing Block

Two interesting devices have been developed by the William H. Dalton Company, Salem, Mass., for embossing and for printing without ink by means of electric heat. In Fig. 1 is illustrated the embossing outfit, as it is called, showing the die-holding plate, three-heat controller, cable and plug. A front view of the die-holding plate with die attached is shown in Fig. 2, and in Fig. 3 is seen a back view of the plate, showing the screws which secure the die and prevent it from slipping. There are no clips or slides which can loosen, throwing the die out of place. In the two last-mentioned illustrations the plate is shown ready for attaching to the block, preparatory to locking up in the chase of an ordinary job press. The die-holding plate may be quickly and easily removed from the block while

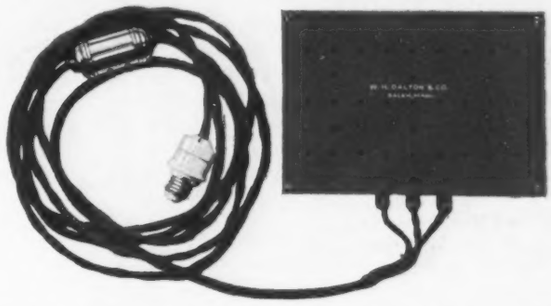
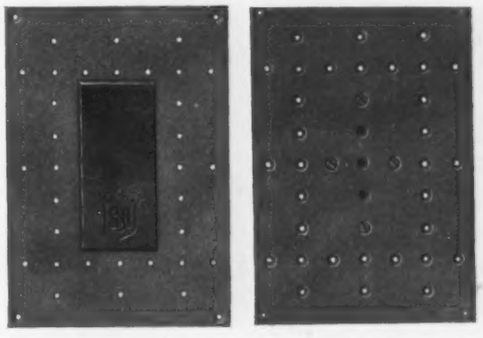


FIG. 1—EMBOSSING OUTFIT, SHOWING DIE-HOLDING PLATE AND THREE-HEAT CONTROLLER

the block is locked in the press, a feature which is of advantage when changing from one job to another. The embossing outfits are being made in the following sizes: No. 1, 3.5 in. by 5 in.; No. 2, 7 in. by 10 in.; No. 3, 10 in. by 14 in.; No. 4, 12 in. by 18 in. The No. 1 set has only one heat and takes 165 watts. The other three outfits each have three heats, the energy taken being as follows: No. 2, 220 watts, 440 watts and 660 watts; No. 3, 440 watts, 880 watts and 1320 watts; No. 4, 675 watts, 1350 watts and 2025 watts. The embossing blocks are particularly well adapted for use by bookbinders, tip printers, candy-box-top makers, paper-box manufacturers, chair manufacturers for embossing chair backs, etc., in addition to general printers, for whose use they are primarily intended.

The design of the high-temperature printing apparatus made by the above company is based on the same principle as that of the embossing blocks, but there are modifications adapting it to use in conjunction with box-making machines. The blocks are being employed with ordinary job printing presses and also in machines for cutting and creasing folding boxes, very curious effects being sometimes obtained owing to the action of the heat on the chemical ingredients of the stock on which the impression is made. When utilized with the



FIGS. 2 AND 3—FRONT VIEW OF DIE-HOLDING PLATE WITH DIE ATTACHED, AND BACK VIEW OF PLATE

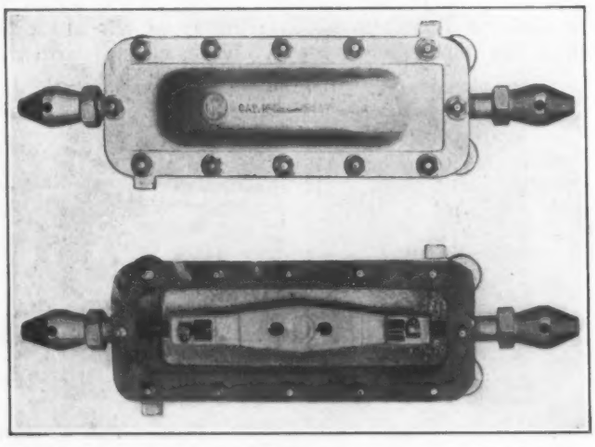
folding-box machine a box can be turned out complete with a single operation (in some cases two boxes at one impression), thereby eliminating the separate operation of printing after the box is cut and creased, the usual procedure where ordinary ink printing is performed. Impressions can be made, it is declared, at the same speed as in ordinary printing, 1800 to 2000 per hour.

Socket with Porcelain Covering

Harvey Hubbell, Inc., Bridgeport, Conn., has developed for use with nitrogen-filled lamps in refrigerating plants, steamships, etc., where corroding elements are constantly present, a socket with a porcelain covering in place of the ordinary brass shell. The socket is of the Mogul-base type and is equipped with either a ⅜-in. or a ½-in. aluminum cap. A rubber gasket is utilized to provide a tight joint between the upper and lower portions of the socket, making it weatherproof. Long binding screws with large heads are employed. The manufacturer claims that these have greatly simplified the operation of wiring, permitting ample room for the loop to mat and confining all stray wire ends.

2500-Volt Primary Cut-Out Box

A box has been designed by the H. W. Johns-Manville Company, New York, to meet the requirements of public-utility and electric-railway companies and railroads for an underground single-pole fuse gap for use in sectionalizing feeders and for protecting the primaries of distribution transformers in manholes or subterranean vaults. The box is convenient to handle and may be installed, it is claimed, where room is limited, as is the case in manholes. It is of close-grained gray cast iron of sufficient thickness of wall to withstand knocking about in transit and during installation. Wide flanges are provided for receiving a flanged lid between which a seamless gasket is interposed, making a water-tight and gas-tight installation when the brass nuts are screwed down. Considerable care has been exercised, the manufacturer points out, in proportioning all gaps between the containing box and the live metal fuse contacts. The porcelain base is mounted inside the containing box upon brackets away from the back of the box. The fuse clips into which the knife blade "Noark" fuse is inserted are of hard-drawn copper kept in permanent tension by steel springs. A labor-saving feature of the device is the cable union, which allows every incoming and outgoing cable to be pot-headed and makes it possible to wipe on the lead sheath while the cable is swinging free and compound it as well as to prevent the admission of moisture. After the pot-head is completely made the union can be inserted and the cable fastened to the fuse lug without twisting. It is especially convenient to construction gangs working in cramped manholes, since the only labor necessary in connecting the cable to the box is the insertion of the union. The box is designed for a pressure of 2500 volts and for a current of from 0.5 amp to 100 amp. and is well adapted for use, it is asserted, with any single-pole fusing arrangement that is necessary in alternating-current subterranean distribution.



2500-VOLT CUT-OUT BOXES FOR USE IN MANHOLES

Connector for Electric Wires

A device for disconnecting a customer's electric service wires when a building is vacated in order to prevent unauthorized use of energy by subsequent occupants, without their first having made application to the central station for service, has recently been placed on the market by the Economy Service-Connector Company, 609 West Fifth Street, Coffeyville, Kan. The connector is made in two sizes, the type A device being rated at 40 amp. and the type B connector at 80 amp. Each connector is equipped with terminals which can be used with wires of Nos. 0, 2, 4, 6, 8 or 10 B. & S. gage. Both types of connectors are of No. 18 B. & S. gage bronze and are provided with brass screws and nuts for securely clamping the terminals on the wire without soldering. One connector can be engaged with another, as shown in Fig. 1, so as to make a contact over a large area, thereby insuring a good connection. Each size is interchangeable with any other so that two of the type A connectors can be used with one type B if desired. One connector is usually clamped on the main-line wire and the other connector on the free end of the service wire, as shown in Fig. 2, where distribution for six consumers is made from the same pole. To disconnect or reconnect a consumer's circuit requires no tools as a mere twist disengages the service wire from the main-line wire, thereby opening the circuit, and to reconnect is equally simple. The use of the connectors eliminates cutting or unjointing the wires when service is discontinued and re-splicing when service is re-established, thereby saving considerable time and expense.

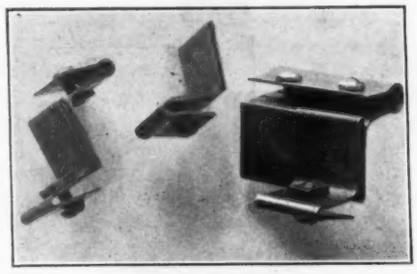


FIG. 1—CONNECTOR FOR DISCONNECTING SERVICE WIRES

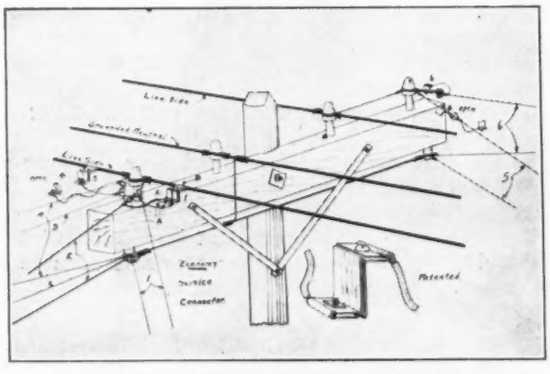


FIG. 2—CONNECTORS CLAMPED TO MAIN WIRES

News of the Industry

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

POST-WAR TRADE PROBLEMS

Senator Borah Urges Preparation for Industrial War, Tariff Revision, and Government Ownership of Utilities

While the country is calling upon experts to assist in a program for upbuilding the army and navy, Senator William E. Borah, one of the ablest statesmen in Washington, would also summon the best brains of the country to prepare for the great industrial problems that must be faced at the end of the European war. He foresees a new Europe industrially when the war is over and predicts that the United States must fight as it never fought before for the markets of the outside world as well as to retain its markets at home. In an interview which he gave the New York *Sun*, the senator from Idaho said in part:

"While we are calling in experts to assist in a program by means of which we are to build up the navy and strengthen the army it would be a most wise and provident thing if we would call the judgment of expert economists and publicists to consider where we shall stand industrially and how we shall meet the industrial situation when the war shall have ended. I am frank to say I am much more interested in the preparedness for peace than for war, although I think both important.

Competition with Europe

"Every one seems to concede that the situation will be a serious one. The Department of Commerce has sent out a bulletin asking for suggestions how best to protect ourselves against the invasion of the industrial army after the war. Certain it is that the standard of living will be reduced to the lowest possible level in Europe. It is equally certain that wages will also be reduced to the lowest possible level. Yet Europe, combined Europe, will be fighting to regain her markets. Our laborers will come into fierce competition with European labor. Our manufacturers, our farmers and producers will come into fierce competition with the manufacturers and producers of Europe.

"When the war is over we shall know a new Europe industrially, and we are not prepared to fight for our own markets, much less the markets of the world, as against combined Europe, aroused as she will be to uncommon energy to regain her markets and pay off her tremendous debts. The pressure of Europe, which will spur her to the highest endeavor, will be no less in peace than in war.

The Effect of Peace on Labor

"Our laboring men will be the first to feel the effect of it, for we must bear in mind that at the breaking out of this war there were 3,000,000 workingmen out of work in this country, and they did not go to work until the war orders came in.

"The manufacturer and the farmer will feel the strain and the fierce competition in the same way. We shall be careless and short-sighted to the last degree if we do not prepare against these days. We should, through a most thoroughly equipped non-partisan board of experts, gather the most effective data possible and the best judgment upon how to meet the situation, and when this expert knowledge is obtained Congress should act without delay. I feel sure we ought to readjust our tariff laws, but that we ought to do so only upon a broad scale and upon a plan commensurate with the situation which confronts us and after a most thorough gathering of data and of the opinions of those who have given consideration to the subject in the light of present conditions.

Government Ownership Intimated

"While our good crops and our war orders have given us activity in certain lines, yet outside of those lines men are hesitating. Real estate is at a standstill all through the West and Middle West. No private canals are being built; no funds can be secured for that purpose, plentiful as they are. There is no extension of railroads. The banks are plethoric with money, but there is no initiative, no development, no new enterprises outside of the lines affected by war orders and within the charmed circle of the 'war brides.'

"There is another matter which I am not going to discuss, but which is tremendously interesting, and that is this, that war will have advanced state socialism in five years more than it had advanced before the war during the last hundred years. The next great political issue in this country is going to be that involving government ownership of public utilities. Regulation in the minds of many people has broken down. It is not satisfactory to the public nor to the owner of the property. Efficiency in this war has come from those countries most highly and pronouncedly given over to state socialism, and even France and England have made tremendous strides in that direction out of sheer necessity. The question will be asked, If it gives efficiency in war why shall we doubt that it will give efficiency in peace? And we will have the question of public ownership up for consideration."

National Foreign Trade Convention Called

James A. Farrell, president of the United States Steel Corporation, has issued a call for the third national foreign trade convention to be held in New Orleans on Jan. 27, 28 and 29. The convention will be held under the auspices of the National Foreign Trade Council, of which Mr. Farrell is chairman. The motto of the convention will be "Commercial Preparedness," not preparedness for war, but preparedness to meet the commercial situation with which this coutry will be confronted when the European nations now embroiled in war resume once more their commercial activities.

"All Americans engaged in or desirous of entering oversea commerce are invited," runs the call, "to participate in this practical and constructive discussion of policies and practices necessary to meet the keener competition which the United States may expect to encounter in world markets after the war. The rehabilitation of the American merchant marine, the utilization of the tariff to encourage American foreign trade and protect it from discrimination, the adaptation of commercial education to the needs of foreign trade, and ways and means for the smaller manufacturers and merchants to engage in and share the benefits of foreign trade, will be considered from the standpoint of the chief elements in foreign trade, namely, natural products and agriculture, manufacturing, merchandising, transportation and finance."

"CASHING IN" ON PROSPERITY WEEK

Plans Effected in Boston and Brooklyn for Campaigns with Help of Local Contractors

With General Superintendent W. H. Atkins of the Edison Electric Illuminating Company of Boston presiding, a general New England committee meeting in connection with plans for Electrical Prosperity Week was held at the Engineers' Club, Boston, on Oct. 22. Forty-one central-station representatives were present, with about a dozen other affiliated committee members. J. M. Wakeman, general manager of the Society for Electrical Development, New York City, addressed the meeting. He said that the use of electricity in the factory means greater production and more economy, and consequently a proportional increase of wealth. Its wider application in the home means greater comfort, and since the combination of wealth and comfort is synonymous with prosperity, it is evident that the term "Electrical Prosperity Week" has a very real significance.

In New England plans are afoot for the use of flood-lighting on public buildings during the week. Mr. Atkins said that the Boston Edison company is endeavoring to secure permission to install flood-lighting to illuminate the new Boston Custom House tower, the highest structure in New England. L. D. Gibbs, superintendent of advertising for the Boston Edison company, told of the publicity and advertising work done in connection with the campaign. The company will supply material to 150 contractors in its territory. In each town flood-lighting will be used, and in Boston on Nov. 16 an electrical exhibit will be a feature of a Rotary Club display in Horticultural Hall which will last four days. Space has been taken by the Edison company and by electrical contractors. Half-page advertisements are being inserted in theater programs featuring the new cooking rate of the Boston company. Sixty committees are now at work in New England on Electrical Prosperity Week affairs, President C. L. Edgar of the Boston Edison company being at the head of the movement.

The Edison Electric Illuminating Company of Brooklyn, together with the Kilowatt Club of that city, composed of contractors, jobbers, fixture dealers, etc., will during Electrical Prosperity Week carry on a campaign of house-wiring and offer cumulative discounts of 10 per cent on the contracts secured during the week. Thus, if the bill of the Edison Electric Illuminating Company of Brooklyn for the work were $150, it would automatically cut off $15; if of that $150 the electrical contractor was to receive $100, he would automatically cut off $10, and if the cost of the fixtures were $30, the fixture manufacturer would automatically cut off $3, so that the customer by making a contract during Electrical Prosperity Week would effect a saving of $28. In addition the company plans to spend $5,000 in advertising the campaign.

United Company Holds Annual Booster Meeting

The sales department of the United Electric Light & Power Company of New York City held its third annual booster meeting on Oct. 23, with more than 100 people present, including the entire sales force, several heads of departments and the officials of the company, as well as John W. Lieb, vice-president of the New York Edison Company and a director of the United Company. The afternoon was devoted to a tour of inspection of the company's buildings, and dinner was served at the Hotel Martinique, after which several addresses were made. Joseph F. Becker, sales manager of the company, outlined the work accomplished during the first nine months of the current year, giving comparative figures. Frank W. Smith, vice-president of the company, reviewed the work of the sales department during the recent campaign for new business and described in some detail the construction work that has been carried on by the company during the past year. He made the point that with the growth of the company's business the individual responsibility of every employee from office boy to president becomes greater. He said: "With the growth of the business and the greatly increased number of customers personal contact with the customers is divided among a number of employees, with each one of whom I would leave this thought—the impression which you individually create upon the mind of a customer is to a very large extent the impression which that customer will have of your company, and thus as the business grows your responsibility increases."

Convention of American Manufacturers' Export Association

Many of the vital and important aspects of the American export situation were enthusiastically discussed at the sixth annual convention of the American Manufacturers' Export Association, held at the Hotel Biltmore, New York City, on Oct. 27.

Six papers were presented at the convention, as follows: "Transportation in Relation to the Export Trade of the United States," by Prof. Emory R. Johnson of the University of Pennsylvania; "Two Ways of Increasing American Export Trade," by B. Olney Hough, editor *American Exporter;* "A Course in Training for Foreign Trade," by Prof. Guy E. Snider of the College of the City of New York; "North American Investment in South America," by Percival Farquhar, president Brazil Railways Company; "The Establishment of a Tariff Commission," by John C. Cobb, president National Tariff Commission Association, and "Banking in Relation to Foreign Trade," by Isaac N. Seligman of J. & W. Seligman & Company.

At the morning session resolutions were adopted urging the modification of the seamen's act, recommending the appointment of a shipping board composed of persons experienced in problems affecting ocean transportation to prepare and submit to Congress for its adoption a plan for upbuilding the American merchant marine, and urging the heartiest co-operation between American manufacturers and exporters and American banking institutions to the end that the latter may be encouraged more generally to extend these banking facilities and more widely to establish their branches abroad.

The association placed itself on record as heartily approving the creation of an official non-partisan, non-political tariff commission, composed of experts, whose scientific investigations may form the basis of intelligent action by Congress, and recommended that the tariff be utilized as an effective instrument for furthering the export trade of this country by reciprocal provisions which may be invoked to obtain concessions from other countries, in this way utilizing similar means to those which are employed to their own advantage by other countries.

E. M. Herr, president Westinghouse Electric & Manufacturing Company, was elected to serve as president of the association for the ensuing year. W. W. Nichols, assistant to the chairman of the Allis-Chalmers Manufacturing Company, was elected first vice-president; A. N. Hargrove of the J. G. Brill Company, second vice-president; L. Moon of the C. W. Hunt Company, third vice-president; Lindsay McCandlish of the Hutchinson Coal Company, George E. Long of the Dixon Crucible Company, and H. K. Mulford, directors.

Minor Surgery with a Pocket Flashlamp.—To locate a splinter under the finger nail is often difficult. By placing the fleshy part of the finger against the lens of a pocket flashlight in a dark room, however, the splinter can be plainly seen through the nail almost as if it were under the X-ray.

Massachusetts Holders of Stock in Corporations in Other States Taxable in Both States.—The full bench of the Massachusetts Supreme Court has decided that owners of stock in a corporation may be taxed on that ownership in the State in which the corporation has its domicile, and also in Massachusetts should they live there. The Bellows Falls Power Company owned stock of a Vermont corporation and unsuccessfully sought to recover a tax of $2,729 paid in Massachusetts.

Negligence of Superintendent.—It was held by the Supreme Judicial Court of Massachusetts (109 N. E. 641) that evidence in an action to recover damages for the death of an employee who was an experienced machinist, and who, while setting up machinery—a job left by the superintendent to be done by the deceased with a helper in his own way—broke through the insufficient temporary covering negligently placed by a fellow-servant over a hole in the floor made for the work in progress, was insufficient to show negligence of the superintendent under the employers' liability act.

The Turbo-Electric Ship Mjolmer for Service in Ice-Bound Waters.—A Swedish shipbuilding firm now has under construction for the coasting trade around Sweden the 225-ft. vessel Mjolmer, having a displacement of 2250 tons. The normal speed is 11 knots, for which 900 hp. must be delivered to the propeller shaft. A single double-rotation turbine drives two alternators which deliver three-phase current to two motors driving a common helical spur wheel on the propeller shaft. Each turbine unit is rated at 400 kw., and the frequency is 120 cycles. The motors run at 800 r.p.m. and the propellers at 85 r.p.m. Slipping clutches are introduced between the motors and their spur wheels in order to guard against the teeth of the latter being broken when the vessel is navigating in ice-bound waters. The Mjolmer has been guaranteed by its builders to attain a coal consumption at least 30 per cent less than that of its sister ship built at the same time with reciprocating engines and ordinary drive. The engine-room plant of the Mjolmer is also much smaller, and because of the reduced consumption of fuel the bunkers are more compact.

Recovery of Damages by Visitor.—A person visited a substation to have a bill certified and was invited by the agent in charge to visit the high-tension gallery, where he was injured. The visitor pointed to some insulators and, being very near, an arc jumped from an insulator to his finger. The lower court charged the jury upon the plaintiff's right to recover on the theory that he was invited and therefore licensed to enter the gallery. The Supreme Court of Georgia held (86 S. E. 319) that the use to which a high-tension gallery is put repels the idea that one there on business of the nature of the plaintiff's business with the company should enter it. The plaintiff went as a volunteer or intruder upon that part of the premises of the defendant company where he received his injuries, and the lower court erred in its charge to the jury.

Multiphase Currents

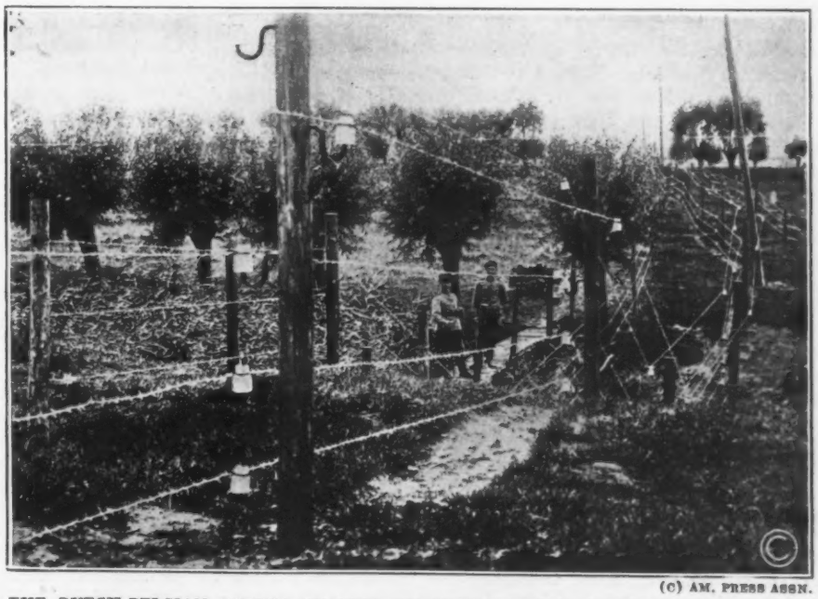
Miscellaneous News Items Picked from the Happenings of the Industry

An Electrical Journal for the Icelanders.—*Elektron* is the name of the latest addition to the electrotechnical press of the world. *Elektron* is published monthly at Reykjavik, the capital of Iceland, which island country of waterfalls has in recent years been the scene of much hydroelectric development. Considerable progress has also been made in the use of electricity for lighting and power purposes. The new publication has been established to foster the electrical industries of Iceland.

Electricity Guards Belgium's Border.—For guarding the Dutch-Belgian international line barbed wires, as shown below, are strung along the border on short poles and placards near bordering towns give notice in four different languages that the wires are charged. The line is paralleled at a distance of some 10 ft. on each side by an uncharged barbed-wire fence. These second fences effectually prevent innocent persons from coming in contact with the charged wires. Not only has this system of high-voltage lines efficiently prevented the escape of Belgians from territory now under German rule, but it has also made it feasible to cut down the large number of sentries who would otherwise be necessary for this work and has allowed their use in the trenches.

Snakes on Japanese Transmission Lines.—Crows and snakes, according to a Japanese engineer, cause much trouble and even occasional interruptions in the operation of high-tension transmission lines in the Island Empire. The crows perch on the cross-arms and ground the circuits with their wings, while the reptiles climb the towers to sun themselves on the cross-arms, as they are in the habit of doing on branches of trees, and, getting across the conductors, create short-circuits.

Power Company Not Liable for Injuries if Strange Third Party Cuts Fallen Lines.—During a severe storm one of the two-wire transmission lines of the Sonoma Valley company fell to ground while the current was off. A man not connected with the company, fearing an accident to passers-by, cut the wires and coiled them up. The two coils of one wire he placed on a redwood picket fence and the two ends of the other wire he tossed on the ground under a tree. When the current was turned on soon afterward a circuit was established through the ground between one of the ends on the fence and one of the ends under the tree with the result that the grass under the tree caught fire. A woman went to put the fire out and in so doing came in contact with the wire under the tree, establishing a better ground, and was electrocuted. The jury in the Superior Court decided that the power company was not liable for the woman's death because a strange third party by cutting the wires and so disposing of them made it impossible for the company to know that the line was down, and also because the act of the third party was the direct cause for the death on account of the particular way in which the wires were placed.



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THE DUTCH-BELGIAN BORDER GUARDED BY HIGH-TENSION BARBED-WIRE BARRIERS. NOTE "SAFETY FIRST" FENCES TO PROTECT AGAINST ACCIDENTAL CONTACT WITH THE CHARGED BARRIER

Associations and Societies

Syracuse Electrical League to Open Season.—The second season of the Syracuse (N. Y.) Electrical League will be opened on Nov. 1. The business of this meeting will be the formulation of plans for the local observance of Electrical Prosperity Week. John W. Bryant is secretary of the league.

Steinmetz Addresses Chicago Electrical Men.—The Chicago Electric Club-Jovian League was addressed at its meeting on Oct. 26 by Dr. C. P. Steinmetz. Congressman Fred A. Britten, who has just returned from a trip to Japan and China, spoke at the meeting on Oct. 21 on the topic "Can We Afford to Remain Unprepared in the Pacific?" The meeting scheduled for Oct. 28 was canceled.

West Virginia Utilities Association at White Sulphur Springs.—The Public Utilities Association of West Virginia will hold its annual convention at White Sulphur Springs, W. Va., Nov. 18 and 19. The association is composed of electric railways, electric light and power companies, water companies and telephone companies operating in the State. W. C. Davisson, Charleston, W. Va., is secretary of the association.

Meeting of Pittsburgh Section, I. E. S.—The October meeting of the Pittsburgh Section of the Illuminating Engineering Society was held in the room of the Engineers' Society of Western Pennsylvania in the Oliver Building on Oct. 22. J. L. Mimick of the Pennsylvania Railroad Company presented an abstract of L. B. Marks' report before the national body on a code of lighting for factories, mills and other workplaces. A paper on "Yellow Light" was presented in abstract by M. Luckiesh. Preceding the meeting the members of the section had a "get-together-and-get-acquainted" dinner at the Fort Pitt Hotel.

Officers of Association of Railway Electrical Engineers.—At the eighth annual convention of the Association of Railway Electrical Engineers, held at the Hotel LaSalle, Chicago, Oct. 18 to 22, the following officers were elected: President, E. W. Jansen of the Illinois Central Railroad; first vice-president, C. J. Causland of the Pennsylvania Railroad; second vice-president, J. E. Gardner of the Chicago, Burlington & Quincy Railroad; secretary and treasurer, J. A. Andreucetti of the Chicago & Northwestern Railway, and members of the executive committee, E. Wanamaker of the Chicago, Rock Island & Pacific Railroad and E. S. M. McNab of the Canadian Pacific Railway.

Joint Meeting of A. E. S. and I. E. S.—The second regular meeting of the season of the New York Section of the American Electrochemical Society will be held jointly with the Illuminating Engineering Society at the Engineering Societies Building on Nov. 11. The subject of the evening, "Electrical Phenomena in Vapors and Gases," will be discussed in the following papers: "Unstable States in Arc and Glow," by Walter G. Cady, Wesleyan University; "Gaseous Conductor Light," by D. McFarlan Moore, Edison Lamp Works, Harrison, N. J., and "Electric Arc in Complex Vapors at Reduced Pressures," by W. A. Darrah, Mansfield, Ohio. The speakers will illustrate their addresses by experiments and lantern slides.

New-Business Co-operation Convention.—There will be a convention on Nov. 17 at the club rooms of the Middletown Gas & Electric Company in the Merchants' National Bank Building, Middletown, Ohio, of the committee on new-business co-operation of the Ohio Electric Light Association. The program which has been arranged for the convention follows: Address of welcome, by L. C. Anderson, vice-president of the Ohio Electric Light Association and general manager of the Middletown Gas & Electric Company; "Electrical Advertising," by W. A. Wadsworth, commercial department of the Union Gas & Electric Company, Cincinnati; "Power-Sales Problems," by H. J. Kunz, new-business department of the Toledo Railways & Light Company; "Increasing Small-Motor Loads on Central-Station Circuits," by F. S. Dellenbaugh, Jr., small-motor department of the Westinghouse Electric & Manufacturing Company. Mr. Anderson has arranged for a visit to the plant of the American Rolling Mills Company. J. E. North, contract agent of the Springfield Light, Heat & Power Company, is chairman of the committee.

Shop Lighting Discussed at Merchants and Manufacturers' Association Meeting.—The subject discussed at the meeting of the Merchants and Manufacturers' Association of Milwaukee, Wis., on Oct. 11 was "Shop Lighting." Fred Schwarz, chief engineer of the Pfister & Vogel Leather Company, told of the types of lamps he has found most efficient and the manner of their installation. Fred Dietz talked on "The Cost of Installation," R. F. Johnson on "Cost of Lamps and Reflectors," S. J. Gates on "Shop Lighting," and J. D. Beck of the Industrial Commission on "Bad Sanitation and Accidents."

Public Service Commission News

Idaho Commission

The Public Utilities Commission of Idaho has handed down an order in the case of the city of Sandpoint versus the Sandpoint Water & Light Company ordering a reduction in the rates of the company. As to the policy of adopting a fixed rate of return to be allowed a utility on its investment, the commission says: "The rate of return will be determined in each individual case, giving due consideration to efficiency and economy in management, and thus afford a stimulus for the utility to increase its business, to reduce its operating expenses, and thereby reduce the cost of the commodity to the consumer. If a public utility can by efficient management reduce the operating expenses below the ordinary amount, or if it can by the application of a broad and public-spirited policy so develop its business as to increase its earnings, it is certainly entitled to share in the increased earnings directly resulting therefrom. We believe that the application of this policy will create an incentive to greater and more efficient effort on the part of the investor, and that it will redound to the benefit of the community served, as well as to that of the entire State."

New York Commissions

The Public Service Commission, First District, New York, in its order handed down on Oct. 15 against the New York Edison Company and the United Electric Light & Power Company, with reference to making free renewals of tungsten lamps of 50-watt rating and over after Jan. 1, 1916, did not modify its order effective May 1, 1915, allowing the renewal of tungsten lamps when the customer paid an additional half cent per kilowatt-hour for energy. It was erroneously reported in last week's number that the order just handed down cuts out this half cent per kilowatt-hour. The complete copy of the order of the commission, now before us, makes no such exception.

The Public Service Commission, Second District, New York, in granting the first application for a certificate of convenience and necessity for a jitney bus line in New Rochelle, while holding that the duty of the commission is to protect already established utilities under its jurisdiction from unnecessary competition, also enunciated the following principles which guided it in its decision: That the commission's duty to the public, entitled at least to some individual liberty in choice of means of transportation, should come before its duty to protect vested capital except where such choice would lead to competition surely ruinous to interests which the public assumes to regulate.

It is recognized that, owing to recent improvements in automobile construction and maintenance of public highways, the motor-bus line rather than the trolley will be the relief sought by persons residing away from existing trolley lines who desire transportation facilities.

Indiana Commission

The Public Service Commission of Indiana has issued an order lowering the minimum monthly charge to subscribers to service from the Bicknell Light & Power Company from $1 to 50 cents. The rates charged by the company for lighting service and power also have been reduced. Formerly the company charged a flat rate of 10 cents per kilowatt-hour for lighting, and the new schedule reduces this to a basis of 9.5 cents to 5.5 cents, with 0.5 cent discount for prompt payment. The motor-service rates were established on a scale of 6 cents to 3.5 cents per kilowatt-hour, with 0.5 cent discount for prompt payment.

Corporate and Financial

American Gas Company, Philadelphia, Pa.—Beginning with the dividend payable Dec. 1, the company's annual dividend rate will be 8 per cent, an increase of 1 per cent, which is the second increase in dividend rate made by this company. Prior to 1909 the rate was 6 per cent, after which it was 7 per cent until the present raise. Morris W. Stroud, president of the company, writes: "The reason for this action on the part of the board of directors was because of the steady growth of the company, the increased earnings and the good-sized surplus which the company is accumulating."

American Public Service Company, New York, N. Y.—A block of first lien 6 per cent gold bonds due Dec. 1, 1942, is being offered at par and interest. A statement of earnings for the twelve months ended June 30, 1915, is given as follows:

Gross earnings	$516,097
Operating expenses, maintenance and taxes	336,522
Net earnings	$179,575
Bond interest	97,242
Balance	$82,333

American Telephone & Telegraph Company, New York, N. Y.—A report of the earnings for the eight months ended Aug. 31, 1915, of the Bell telephone system, the American Telephone & Telegraph Company, and associated holding and operating companies in the United States, not including connected independent or sub-licensee companies, is shown herewith. Attention is called to the increase in surplus earnings of almost $3,000,000 in the first eight months of 1915 compared with the corresponding period in 1914. The surplus earnings for 1915 up to the end of August were almost 9,000,000, an average of more than $1,000,000 a month. The accompanying report excludes all duplications, including interest, dividends and other payments to the American Telephone & Telegraph Company by associated holding companies.

	1914	1915
Gross earnings	$149,669,237	$156,750,415
Expenses	110,765,283	113,955,873
Net earnings	$38,903,954	$42,794,542
Deduct interest	12,547,139	12,281,386
Balance, net profits	$26,356,815	$30,513,156
Deduct dividends	20,277,995	21,568,279
Surplus earnings	$6,078,820	$8,944,877

California Railway & Power Company, San Francisco, Cal.—The second annual report of the company, covering the year ended June 30, 1915, shows an income of $141,268, exenses and charges of $14,071, and net income of $127,197. To this net income is added a previous profit and loss surplus of $115,936, making a total gross surplus of $243,133. Dividends of 7 per cent on the prior preference stock, amounting to $199,500, are deducted, leaving a profit and loss surplus of $43,633 on June 30, 1915. Prior preference stock to the amount of $100,000 par was called for redemption on Jan. 2, 1915.

City Light & Water Company, Amarillo, Tex.—A closed issue of $250,000 of one-year 6 per cent secured gold notes, due Sept. 1, 1916, is being offered at par and interest. From the proceeds of the sale of these notes the company must retire all of its floating debt, amounting to approximately $150,000. The balance will furnish the company with money for extensions and improvements necessary during the present year and will provide it with adequate working capital. The company reports earnings for the years ended July 31, 1915 and 1914, as follows:

	1915	1914
Gross earnings	$128,872	$120,881
Operating expenses	74,268	111,057
Net earnings	$54,604	$9,827
One year's interest on notes	15,000	
Balance	$39,604	

Coast Valleys Gas & Electric Company, San Francisco, Cal.—The gross income of the company for the year ended June 30, 1915, shows a reduction of less than 1 per cent, notwithstanding the heavy and continuous rains in the section served by the company, which materially lessened the demand upon it for electric energy for pumping for irrigation purposes, and also notwithstanding the reduced rates required by the California Railroad Commission. The net income for the year after charges was $28,347 and the total profit and loss surplus was $45,788.

Columbia (S. C.) Railway, Gas & Electric Securities Company.—A limited number of convertible 6 per cent secured gold notes due Oct. 1, 1917, are being offered at 99.5 and interest.

Cumberland County Power & Light Company, Portland, Me.—The first annual report of the company, for the year ended June 30, 1915, has been made to the stockholders. The gross earnings of the light and power department in Portland and vicinity show an increase of $40,605, due to increased revenue from the sale of electric energy and appliances, stimulated by active house wiring and new-business campaigns inaugurated in November, 1914; to more energy having been sold to the Portland Railroad Company, and to revenue from the York County Power Company for surplus energy delivered to Biddeford in 1915. Operating expenses show an increase of $6,723, caused principally by the expenses of advertising and soliciting in connection with the new-business campaigns. Interest, etc., shows an increase of $4,538, due for the most part to the fact that $100,000 of the first and refunding mortgage 5 per cent bonds were sold during the year. Owing to the fact that the earnings and expenses of the York County Power Company as operated by the Cumberland County Power & Light Company are available only for ten months of the fiscal year 1913-1914, no fair comparison can be made. The business of the company has been increasing steadily, and for the corresponding ten months of 1914-1915 the gross earnings have increased. Operating expenses, taxes and interest, etc., have remained about the same, making the surplus available for dividends and financial requirements of the company show an increase over the similar period of the year previous. The comparative combined results of operation of the Cumberland County Power & Light Company and subsidiary companies, with inter-company items of earnings and expenses eliminated, for the years ended June 30, 1914 and 1915, follow:

	1915		1914	
Gross earnings		$2,551,263		$2,447,406
Operating expenses	$1,331,992		$1,303,797	
Taxes	112,750		106,158	
		1,444,742		1,409,555
Net earnings		$1,106,521		$1,307,451
Interest, etc.		777,210		753,305
Surplus		$329,311		$284,146
Preferred stock dividend		138,000		138,000
Balance		$191,311		$146,146

Empire District Electric Company, Joplin, Mo.—At a special meeting on Oct. 9 the directors authorized the payment of a dividend of 1.75 per cent, payable Nov. 1 to stockholders of record Oct. 15. The policy of the board of directors is to continue payment of a similar dividend on the preferred stock until all accumulated dividends are paid, and to disburse the regular dividend of 0.5 per cent each month thereafter.

Kings County Electric Light & Power Company, Brooklyn, N. Y.—The comparative statement of the combined earnings of this company and the Edison Electric Illuminating Company of Brooklyn for the first nine months of 1914 and 1915 shows a gain in gross operating revenues of $398,757. Operating expenses increased by more than $80,000, taxes by $31,500, and depreciation by approximately $183,000. Non-operating revenue was less by $1,424. Interest on the funded debt was less by $8,663, but that on the unfunded debt was greater by $11,800. The net income applicable for dividends at the end of September, 1915, amounted to $950,079, which is $99,920 more than the net income for the nine months ended Sept. 30, 1914.

Nevada-California Electric Corporation, Denver, Col.—Employees of the company's several operating companies have been given the opportunity of subscribing to a limited amount of the parent company's preferred stock under a plan permitting small monthly payments to extend over a period of five years. The price to employees has not been made public, but is understood to be considerably under the market price. Delos A. Chappell, president of the company, writes: "The total subscription of the employees was two

or three times what we had anticipated. I am in favor of interesting our employees, and a little later I hope to make a small offering of our preferred stock to our consumers. I am inclined to think that much of the future financing of public-service companies will be acomplished along these lines."

Parr Shoals Power Company, Columbia, S. C.—A limited number of first mortgage 5 per cent bonds due April 1, 1952, are being offered at 87 and interest.

Republic Railway & Light Company, New York, N. Y.—The company's statement for September shows a gain of more than $21,000 in gross income. A decrease of almost $1,000 in expenses leaves an increase in net earnings of exactly $22,543.92, or 25.1 per cent. After allowing for interest and dividends, a balance of $28,042 is left for the month, which is 298.36 per cent more than was left as a balance in September, 1914. For the nine months ended Sept. 30 a decrease of $12,187 is shown in gross income. A decrease of $14,214, however, in expenses leaves a slight gain of $1,027 in net earnings. Other income was less by $471, and the interest charges were greater by $10,770. The balance, therefore, at the end of the nine months—$111,846—was $10,214, or 8.37 per cent, less than for the first nine months of 1914.

Sierra & San Francisco (Cal.) Power Company.—The company reports for the year ended June 30, 1915, a deficit after charges of $19,656 and a total deficit in profit and loss at that date of $412,789. It is now thought that the company will be in a position to pay the interest on its second mortgage, series B bonds from and after Jan. 1, 1916, in cash instead of bonds as heretofore. All other bond interest has been fully earned and paid in cash in the past. The business of the company outside of the sale of energy to the United Railroads of San Francisco, which amounted for the year ended June 30, 1914, to $397,963, or approximately 35 per cent of the gross receipts, increased for the following year to $455,276, or 39 per cent of the gross. Capital expenditures in the last year amounted to $273,305.

United Railways Investment Company, San Francisco, Cal.—In submitting its annual report for the year ended June 30, 1915, the company includes the latest statements of its subsidiary companies and reviews the system in all its more important aspects. The 6 per cent serial notes of 1908 have now been reduced from $3,500,000 to $700,000, $2,800,000 of notes having been canceled. The 6 per cent convertible gold bonds of 1910 have been reduced from an original issue of $1,229,000 to $790,000. Notwithstanding the depression in Pittsburgh industries during the past year, the Duquesne Light Company increased the number of its contracts by 5389, the total now being 48,485. Sales of energy for the year ended March 31 last showed an increase of 10,181,559 kw.-hr., or about 4 per cent, making a total of 268,749,209 kw.-hr. This company also supplies all of the electric energy used on the 600 miles of track of the Pittsburgh Railways Company. In response to increasing business demands the Duquesne company has installed additional new equipment and has largely increased the capacity of its generating stations during the last two years, thereby generating energy at a substantially reduced cost. These additions and improvements have cost $5,444,505, and President Starring estimates that the value of the property operated by the company is over $20,000,000. In the coming year installations will be made to effect further savings. The income accounts of the United Railways Investment Company for the year ended June 30, 1915, show a gross income of $1,749,826, while expenses and interest charges were $1,259,906, leaving a surplus of $489,920. The previous surplus was $5,695,997, and the discount credit on sinking-fund bond purchases was $99,601, making a total surplus of $6,285,518.

Utah Power & Light Company, Salt Lake City, Utah.—A block of first mortgage 5 per cent gold bonds, due Feb. 1, 1944, is being offered at 93 and interest. The earnings of the company for the year ended Sept. 30, 1915, follow:

Gross earnings	$3,093,632
Operating expenses, including taxes, maintenance and rentals	1,634,916
Net earnings	$1,458,716
Interest on first mortgage bonds	675,000
Balance	$783,716

Manufacturing and Industrial

Wilbur C. Johnson, vice-president of the Waverley Company, Indianapolis, has been elected secretary of the Electric Vehicle Manufacturers' Association to take the place of E. B. Chalfant, was has resigned.

The Carbo Corporation, Rand-McNally Building, Chicago, has on account of the expansion of its business from the manufacture of fence posts to that of steel transmission-line poles, telephone poles, etc., changed its name. The firm was formerly known as the Carbo Steel Post Company.

The Trumbull Electric Manufacturing Company, Plainville, Conn., has transferred H. A. Fisher, an expert panel and switchboard engineer, from Plainville to New York, with headquarters at 114 Liberty Street. Mr. Fisher will devote his attention especially to the company's panel and switchboard business in New York and vicinity.

Electric Products Company.—The Electric Products Company, Cleveland, Ohio, announces the opening of an Eastern branch office at 30 East Forty-second Street, New York City, in charge of F. W. Eller and J. P. Lyons, who will handle sales and service in connection with Wotton battery-charging apparatus and motion-picture motor-generators.

Light and Power Wires on New British Embargo List.—A cable just received at Washington from the American Consulate at London says that exportation is now prohibited to all countries in Europe and on the Mediterranean and Black Seas other than France, Russia, Italy, Spain and Portugal of copper wire, insulated electric-light wire, and cable and power cable. These are new articles on the British embargo lists.

Splendid Business in Small Lighting Plants.—The L. B. Jones Company, 3310 East Fifteenth Street, Kansas City, Mo., is very busy and is running its factory to the limit. On account of the unusually large number of orders being received, the company is from two to three weeks behind on delivery. The Jones company is manufacturing a self-contained gasoline-engine-driven generating set which was described in the Electrical World of Aug. 21, 1915.

Where American Copper Goes.—The exports of copper during the week ended Oct. 16 amounted to 25,359,789 lb. and had a value of $4,860,809. Of this amount of copper 11,603,698 lb., valued at $2,335,907, went to France; 6,460,009 lb., valued at $1,178,875, went to England; 4,625,532 lb., valued at $849,148, went to Russia, and 1,568,426 lb., valued at $287,316, went to Switzerland. The remaining million pounds, valued at a little more than $200,000, went to twenty-two other countries.

Electric Cooking for Portland Apartment House.—Fifty-three Hughes electric ranges, each equipped with four hot-plates and an oven, have been sold by the Portland (Ore.) Railway, Light & Power Company to the owners of a new apartment house, which is known as the Tudor Arms. This order for electric ranges was the largest electric-heating appliance order ever placed in Portland. The ranges were sold through the Western Electric Company's Portland branch, of which J. Ryan is local manager.

Mercury-Vapor Lamps for Motion-Picture Companies.—The Cooper Hewitt Electric Company, Eighth and Grand Streets, Hoboken, N. J., has recently closed contracts for the lighting of studios with its mercury-vapor lamps with the Universal Film Manufacturing Company, Leonia, N. J., the Paragon Film Company, Leonia, N. J., the Plimpton Epic Pictures Company, Mount Vernon, N. Y., the Essanay Company, Chicago, Ill., the Famous Players' Company, New York, the Wizard Company, New York, and the E. K. Lincoln Players' Company, Grantwood, N. J.

Argon-Filled Lamps to Be Substituted for Nitrogen-Filled Units.—The Lux Manufacturing Company, Hoboken, N. J., announces that eventually it intends to replace its nitrogen-filled lamps with argon-filled lamps, thereby assuring greater life and higher efficiency to its products. The company is now turning out nitrogen-filled lamps with ratings as high as 1500 watts. It has also just developed a 40-watt and a 60-watt argon-filled lamp which are described elsewhere in this issue. There is already a considerable demand, the above company reports, for these small lamps.

Lamp Window-Display Contest.—The General Electric Company, Schenectady, N. Y., has inaugurated what it is calling a "national Mazda window-display contest" and is offering sixty prizes for the best displays. The points of merit on which the prizes will be awarded are as follows: Selling value, five points; attention value, two points; unusual ideas, two points; harmonious arrangement, one point. The first prize will be an automobile. H. E. Niesz, past-Jupiter of the Jovian Order, A. J. Edgell, president of the International Display Managers' Asociation, and N. H. Boynton, manager department of publicity, National Lamp Works of the General Electric Company, will be on the board of judges who will review the entries in the contest.

Hotpoint Co-operative Sales Helps for Holiday Trade.—The Hotpoint Electric Heating Company, Ontario, Cal., is preparing an extensive selling campaign for the holidays and Electrical Prosperity Week. To help the various dealers it is sending out cut-outs, Christmas window material, window-display suggestions, newspaper electrotypes, folders, motion-picture slides, holly wrapping paper, postage stamps, etc. During the pre-holiday time the Hotpoint company also intends to issue a so-called "extra special" in the form of a Christmas invitation letter, which will be sent to dealers for mailing to their customers. The company will lay special emphasis on its boudoir set, which has just been brought out and which is described elsewhere in this issue, as a useful appliance for gift purposes.

$225 in Prizes for Window Displays.—The Hurley Machine Company, 29 South Clinton Street, Chicago, is offering three cash prizes of $100, $75 and $50 for the best window displays that contain "Thor" electric washing machines during Electrical Prosperity Week, Nov. 29 to Dec. 4. To enter the competition a dealer must, of course, purchase a Thor machine for display. The machines which are being used for filling these window-display orders are specially rubbed and polished. Machines ordered for Electrical Prosperity Week displays need not be paid for until Feb. 1, a chance being given the dealer to sell the display machine and several more before remitting to the Hurley company. Photographs of the competing displays must be mailed by Jan. 5. Three judges—Sam A. Hobson of the ELECTRICAL WORLD, J. H. Ewing of the Ewing Press and H. G. Carnahan of the Hawtin Engraving Company—will then pick the winners.

Sales Active of Small Turbines in Chicago Territory.—During the two weeks ended Oct. 16 the Westinghouse Electric & Manufacturing Company sold in Chicago six of the small-geared high-speed turbo-generator units which the company recently developed. The turbine ends of these machines operate at from 7200 to 6000 r.p.m. and are of the double-nozzle type, so that it is possible to secure almost as high economy at half load as at full load. The machines are being made for alternating current and direct current in sizes from 15 kw. to 500 kw. Operating through the gear reduction the generators run at speeds varying from 900 to 1200 r.p.m., according to the size. The companies which bought these units in the Chicago territory are the Hoopeston Gas & Electric Company, two of 300-kw. rating; city of Dowagiac, Mich., one of 150-kw. rating; the Northwestern Barbed Wire Company, Sterling, Ill., one of 150-kw. rating; the Redwood Falls (Minn.) Light & Power Company, one of 250-kw. rating, and the Sheffield (Iowa) Brick & Tile Company, one of 150-kw. rating.

Electric Toy Industry Growing Fast.—David W. Knapp, president of the Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York, recently spoke to a representative of the ELECTRICAL WORLD in the most optimistic terms regarding the electric-toy business and declared that the industry in this country is showing a 50 per cent increase each year. Not only are new companies springing up everywhere, but the old companies are enlarging their plants and are continually bringing out novelties. When he first engaged in the toy business, in 1890, Mr. Knapp said, people were interested in electric toys only on account of their entertaining features. Now, however, thoughtful parents are buying them for their children so as to interest them in electricity and to impress on their minds, while in the formative period, the wonders of the art. Mr. Knapp said that his company's business has been increasing 25 to 30 per cent a year, and that recently the floor space of his plant had to be doubled. The present is an especially busy time for the company in preparation for the holiday trade. Electric toys lend themselves well to display purposes, Mr. Knapp stated, and the concern has had considerable success in conducting demonstrations and exhibits in department stores such as Wanamaker's.

The William H. Dalton Company, Salem, Mass., manufacturer of electrical appliances, has recently been incorporated to take over the business which has been conducted by William H. Dalton for the past four years. The company is making a device for operating an ordinary job printing press or a machine for cutting and creasing folding boxes solely with electric heat. It is also engaged in the manufacture of electrical laundry irons, electrically heated blocks for embossing, goldleaf stamping, bookbinders' pallet stoves, ink driers for use on ruling machines and cylinder presses, etc. One concern in Lynn, Mass., it is stated, has already printed over 2,000,000 paper boxes, employing the electric heating process developed by this company. William H. Dalton, president and treasurer of the company, was for twenty-five years in the employ of the Thomson-Houston Electric Company (now the General Electric Company) at Lynn, Mass. For three years he was also with the British Thomson-Houston Company at Rugby, England, as engineer of its arc-lamp department. F. H. Jackson, vice-president, who was identified with the textile industry in Manchester, England, for a number of years, has charge of the commercial business of the company. F. H. Latimer, who is clerk of the company, has had considerable experience as instrument and compass expert both in America and England. He has also been connected with the General Electric Company at Lynn for several years.

International Trade on Conclusion of European War.—After the present European conflict is settled and the nations have again turned their attention to commerce, concerted action will be taken in each of them to resupply those foreign markets which were formerly supplied by it. These and other markets, the foreign papers report, are to be courted by the European exporters. What plans are being laid abroad to capture the world's markets, what importance tariffs and commercial treaties will play in the struggle, and what position the American exporters must take to succeed in the coming commercial conflict for supremacy, are analyzed in the current issue of *The Americas*, published by the National City Bank of New York. A French non-political commission, composed of the shrewdest French manufacturers, merchants and financiers, has long been at work constructing a plan of commercial campaign, frankly stated to be modeled on the line of Germany's organization. Japan has a diplomatic commission visiting in turn the countries of the South Pacific and South America. Germany is reported to be amassing huge stores to be unloaded on the world's markets for the purpose of flooding them as soon as peace is declared. The Tariff Commission of London, which has made a thorough analysis of England's trades, industries and commercial treaties, is urging a British tariff. Russia is looking forward to trade treaties with her allies. All of Europe, in fact, is busying itself in one way or other with plans which will fit its nations for an active participation in the commercial activity which will begin on the resumption of international commerce. In view of the situation, the article recommends that a dependable survey of the industrial position of Europe be made and the situation followed closely as the war progresses in order that it may be known how to make tariff adjustments if any are to be made. The article goes on to say: "It looks very much as if England were about to come to a serious test between her established policy of free trade and a growing demand for protection. It is certain that when the war ends and new commercial treaties are written the Allies will make the international trade arrangements much more favorable to each other than they were before the war. In this country there appears to be forming a serious attempt among men who have become interested in developing a great export trade to get modern commercial treaties between the United States and other countries. Our present treaties are rudimentary affairs. There was a time when we were making the world sit up because of our reciprocity pacts, but all our reciprocity treaties are

now dead, and we are relying upon the 'most favored nation' clauses of venerable documents yellow with age to protect our exports against discrimination in foreign custom houses." The article in conclusion says: "The commercial diplomacy of this generation concerns itself with elaborate, highly technical, minutely specialized and classified tariffs, negotiating over item after item, also with agreements about custom administration and scores of friendly arrangements for facilitating commerce. The old generalities of 'most-favored-nation' clauses are not now effective. Our own treaties are all of the old-fashioned kind, but we are apparently on our way to the making of modern ones."

NEW YORK METAL MARKET PRICES

	Oct. 19 Selling Prices Bid	Asked	Oct. 26 Selling Prices Bid	Asked
	£ s d		£ s d	
London, standard spot	72 17 6		72 2 6	
Prime Lake	17.75	to 18.00	17.75	to 18.00
Electrolytic	17.62½	to 17.87½	17.62½	to 17.87½
Casting	17.12½	to 17.37½	17.12½	to 17.37½
Copper wire base	19.00	to 19.25†	19.00	to 19.25†
Lead	4.50		4.75	
Nickel	.....		45.00	to 50.00
Sheet zinc, f.o.b. smelter	16.00†		16.00†	
Tin, Straits	33.00†		33.70	
Aluminum, 98 to 99 per cent.	54.00	to 55.00†	54.00	to 56.00†

OLD METALS

Heavy copper and wire	14.75	to 15.25†	15.00	to 15.25†
Brass, heavy	10.00	to 10.25†	10.00	to 10.25†
Brass, light	8.00	to 8.50†	8.00	to 8.50†
Lead, heavy	3.80	to 4.00†	4.12½	to 4.25†
Zinc, scrap	9.50	to 10.00†	10.00	to 10.50†

COPPER EXPORTS

Total lb. week ended Oct. 16 25,359

†Nominal.

New Incorporations

The Grove & Greenwald Lighting & Power Company, Melrose, Minn., has been incorporated with a capital stock of $50,000 by Henry G. Meyer, Fred Zieska, N. Kraemer, E. Ortmann and H. G. Schulzenberger, Melrose.

The Citizens' Light & Power Company, Tuckerman, Ark., has been granted a charter with a capital stock of $10,000. The officers are: L. D. Smith, president; L. T. Slayden, vice-president, and William Laner, secretary and treasurer.

The Citizens' Light & Power Company, Volin, S. D., has been chartered with a capital stock of $25,000 by E. O. Lien, H. B. Pierce, P. J. Euhlberg, C. A. Hart and J. C. Peters, all of Volin. The company proposes to construct and operate an electric light and power plant in Volin.

New Industrial Companies

The Sunshine Battery Company, New York, N. Y., has been incorporated by J. Cohen, John R. and Ella R. Crespi, 103 East 116th Street, New York, N. Y. The company is capitalized at $5,000 and intends to manufacture and deal in electrical appliances.

The Plutoscope Corporation, New York, N. Y., has been incorporated by George W. Martin, Thomas H. Ross and John Roth, all of Brooklyn. The company is capitalized at $1,000,000 and purposes to manufacture projection machines, motion-picture cameras, electrical and mechanical devices, automobiles, etc.

The Arc Welding Machine Company, New York, N. Y., has been chartered with a capital stock of $10,000 for the purpose of operating electric welding plants and doing a consulting engineering business. The incorporators are George L. Robinson, Edward N. Matthews and Cyril G. Ballin, 26 West Seventy-fifth Street, New York, N. Y.

The Eureka Automatic Signal Company, Wilmington, Del., has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $350,000 for the purpose of acquiring patents of all kinds and developing them. The incorporators are: Dallett H. Wilson, Bethlehem, Pa.; Mary Z. Bradshaw, Easton, Pa., and Ellen Z. Breed, Cleveland, Ohio.

Trade Publications

Tin Reflectors.—Harvey Hubbell, Inc., Bridgeport, Conn., has issued a leaflet on flat tin, flat tin diffusive and deep-cone tin reflectors.

Electric Laundry Iron.—The W. H. Dalton Company, Salem, Mass., has prepared a leaflet on its electrically operated laundry iron.

Incandescent-Lamp Dimming Attachment.—The Wirt Company, Philadelphia, Pa., has recently issued an illustrated folder on its "Dim-a-Lite."

Used Electric Machinery.—MacGovern & Company, 114 Liberty Street, New York, have recently issued a catalog of used electrical and steam machinery.

Violet-Ray Equipment.—The Sterling Corporation, 1276 West Third Street, Cleveland, Ohio, has prepared a bulletin on its "Baby Violet" high-frequency generator.

Sewing Machine Motor.—The Hamilton-Beach Manufacturing Company, Racine, Wis., has issued an attractively illustrated folder on its new sewing-machine motor.

Small Generating Plants.—Roth Brothers & Company, 1410 West Adams Street, Chicago, Ill., have issued a bulletin describing small gasoline-electric house-lighting plants.

Washing Machines.—A catalog describing an oscillating all-metal washing machine has been published by the Apex Appliance Company, 3223 West Thirtieth Street, Chicago, Ill.

Ornamental Lighting Standards.—The King Foundry Company, St. Joseph, Mo., has issued a large wall placard which illustrates various types of its ornamental lighting standards.

Toy Transformers.—The Thorardson Electric Manufacturing Company, 501 Devonshire Street, Chicago, Ill., is sending out an illustrated folder on its types B and G toy transformers.

Kerosene Torches.—Bulletin No. 60, issued by the Hauck Manufacturing Company, 140 Livingston Street, Brooklyn, N. Y., contains information on kerosene torches and burners for use by linemen and electricians.

Small Lighting Plants.—The Swedish-American Telephone Manufacturing Company, 5235 Ravenswood Avenue, Chicago, Ill., has issued a bulletin which describes its small gasoline-engine-driven lighting plants.

Connectors and Outlet Plates.—The "Hexcel" connector and "Bi-plex" outlet plates for armored cable are described in a leaflet issued by the Sterling Foundry & Machine Company, Irvington, Newark, N. J.

Electric Toys and Specialties.—The Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York, has recently prepared Catalog No. 25, which describes small motors and various kinds of electric novelties.

Steam Pumping.—"The Cost of Pumping Water" is the title of a publication issued by the De Laval Steam Turbine Company, Trenton, N. J. The catalog contains a number of graphical charts with explanatory text.

Electric Cooking Apparatus.—The Simplex Electric Heating Company, Cambridge, Mass., has just issued leaflets which contain information on a recently developed electric toaster, an immersion heater and a percolator.

Portable Vacuum Cleaners.—The Regina Company, 47 West Thirty-fourth Street, New York, is sending out a folder which contains information on its recently developed Model K and Model L portable vacuum cleaners.

Electric Household Appliances.—Catalog No. 56, issued by Landers, Frary & Clark, New Britain, Conn., contains numerous attractive illustrations on various kinds of cooking and heating appliances operated by electricity.

Incandescent Lamps.—The Lux Manufacturing Company, Factory Terminal Building, Hoboken, N. J., has issued an illustrated booklet which contains information on its nitrogen-filled, vacuum and argon-filled incandescent lamps.

Electric Embossing Apparatus.—The W. H. Dalton Company, Salem, Mass., has prepared an attractive booklet which describes its electrically operated embossing block. The cover of the catalog contains an embossed figure prepared with the electric block described in the catalog.

Construction News

New England

RUTLAND, VT.—Details of the Silver Lake power development have been announced by I. M. Frost, Rutland, vice-president and general manager of the Hortonia Pwr. Co., who has had charge of the surveys and preliminary work. The plans include the diversion of two brooks, the building of a series of reservoirs to assist in the natural storage offered by Silver Lake, the tunneling of Fern Mountain, and the construction of a 9000-hp. power plant on the shore of Lake Dunmore. The proposed plant will supply energy in the towns of Leicester, Goshen and Salisbury. The equipment will include three 3000-hp. turbines, water being supplied from three separate tubes, each 2200 ft. in length, the supply being taken from an open concrete forebay, which will be connected with a 350-ft. tunnel to the west shore of Silver Lake.

LYNN, MASS.—Bids will be received by Thomas Campbell, 2d, commissioner of water and water works, City Hall, Lynn, until Nov. 9 for construction of the Ipswich River pumping station as follows: (A) For construction of pumping-station foundations, reinforced-concrete intake, reinforced culvert, etc.; (B) constructing pumping-station superstructure with heating and lighting equipment; (C) furnishing and installing pumping and other equipment and pipe connections. Plans and specifications and form of tenders may be obtained at the office of the city engineer, City Hall. A deposit of $5 will be required for each set of plans.

MARLBORO, MASS.—The Marlboro El. Co. has submitted a proposal to the Board of Aldermen offering to replace the present 60-cp. incandescent lamps with lamps of 80 cp. without additional cost to the city.

OXFORD, MASS.—Additions, it is reported, will be made to the local street-lighting system by the Webster & Southbridge Gas & El. Co., Webster.

PALMER, MASS.—Plans are being considered for the installation of ornamental lamps on Main Street. Several ornamental posts will be erected for demonstration purposes.

QUINCY, MASS.—Extensive improvements are under way at the plant of the Fore River Shipbuilding Corpn., Quincy, Mass., which will involve an expenditure of $2,000,000. Arrangements are being made for a power house to cost $600,000, and an oxygen plant to cost $20,000 will soon be built. A ship-tool shop, to cost $500,000 without equipment, is under way. Plans are under way to extend the yard across Ben's Creek. The company has secured the right to build a slip larger than any in the yard.

WESTBORO, MASS.—The citizens have voted to authorize the Selectmen to enter into a contract with the Westboro Gas & El. Co. for lighting the town for a period of five years.

MANCHESTER, CONN.—Cheney Brothers, it is reported, will start work next spring on the construction of a large power plant in Manchester.

Middle Atlantic

BATAVIA, N. Y.—Plans are being considered for rebuilding the municipal electric-light plant to cost about $22,737.

BUFFALO, N. Y.—The Genesee Street Business Men's Association has submitted a proposition to the Department of Public Works asking that the cluster lamps on Genesee Street be replaced by single-standard magnetite lamps.

EPHRATAH, N. Y.—The Mohawk Hydro-electric Co., Ephratah, has filed amendments to its charter allowing it to operate in a more extended territory in Delaware, Herkimer, Fulton, Montgomery, Otsego, Schenectady and Schoharie Counties, including the cities of Gloversville, Johnstown, Amsterdam and Oneonta.

FULTON, N. Y.—Application has been made to the Public Service Commission by the Fulton Lt., Ht. & Pwr. Co. for permission to issue $40,000 in capital stock.

NEW YORK, N. Y.—The General Electric & Improvement Co., Yale & Towne Building, 9 East Fortieth Street, New York, would like to receive price lists and catalogs on machinery and equipment which will be installed in the $5,000,000 shipbuilding plant which it will erect for the Continental Dry Dock & Shipbuilding Co. The company has the contract and will let subcontracts for the greater portion of the work and would like to correspond with engineers and contractors to this purpose.

NIAGARA FALLS, N. Y.—H. K. Eckert, superintendent of the Niagara States Reservation, has submitted to Albany his 1916 budget calling for an appropriation of $120,000, which includes $40,000 for building an elevator to the Cave of the Winds.

OSWEGO, N. Y.—The Niagara, Lockport & Ontario Pwr. Co., Buffalo, has applied to the Public Service Commission for permission to erect transmission lines in Oswego and for approval of the exercise of rights and privileges under a franchise to cross the West River road highway.

PATTERSON, N. Y.—Application has been made to the Public Service Commission by Ralph Griffing for permission to construct an electric plant in Patterson and for approval of a franchise granted by the town.

POTSDAM, N. Y.—The Northern Pwr. Co., Potsdam, which controls a number of transmission lines from Hannawa Falls and Massena, has closed a contract with the Gregory El. Co. to furnish energy to operate the system in Morristown. A transmission line will be erected from Heuvelton to Morristown, which will also be extended to Hammond and Brier Hill. Electricity will be secured from the Potsdam-Ogdensburg line, which has a branch running to Heuvelton.

SOUTH DAYTON, N. Y.—A special election has been called to submit to the voters the proposal to install a street-lighting system.

WATERTOWN, N. Y.—The Board of Public Works has authorized the extension of the new ornamental lighting system on Factory Street from Mill Street to Factory Square. The plans provide for 40 posts carrying three-lamp clusters.

EASTON, PA.—The Pennsylvania Utilities Co., Easton, has recently closed a contract with the Treadwell Engineering Co., in Palmer Township, to furnish 900 kw. to operate its electric furnace. The company has also secured a contract to supply 400 kw. additional to the Pennsylvania Cement Co. at Bath.

EDINBURG, PA.—The Mahoning & Shenango Valley Traction Co., Youngstown, is planning to erect an electric transmission line from the trolley line into Edinburg to furnish electrical service here.

Progress on the Electrification of the Chicago, Milwaukee & St. Paul Railway

Remarkable progress has been made on the electrification of the mountain division of the Chicago, Milwaukee & St. Paul Railway since the initial order was placed with the General Electric Company in September, 1914. The overhead construction, which will include 650 miles of single track, has now been completed for a distance of more than 200 miles. The 100,000-volt transmission line being erected to parallel the electrified tracks has been completed for an equal distance, and tie-in lines from the 100,000-volt system of the Montana Power Company are ready for service. The illustration shows the general appearance of the new catenary trolley construction and the transmission line. Wooden poles are used throughout for both cross-spans and bracket construction. Seven substations, designed to supply energy to the first half of the 440 miles of route, have been completed, and electrical equipment, consisting of motor-generator sets, switchboards and other accessories, is being installed. Each of the motor-generator sets consists of a 60-cycle, three-phase, 2300-volt synchronous motor directly connected to 1500-volt direct-current generators. The generators are connected permanently in series to supply 3000 volts to the trolley. It is interesting to note in connection with these substations that the motor-generator sets are designed to operate inverted in case the regenerated power exceeds that required by other trains operating near by. The transformers, of which there are a total of thirty-two units (twenty-three 2500-kva. and nine 1900-kva.), will step down the power supply from 100,000 volts to 2300 volts as required by the synchronous motor-generator sets. These transformers will be installed in fourteen substations, which will furnish power for the entire railway from Harlowton, Mont., to Avery, Idaho. In addition to the main transformer equipment, each substation will be equipped with a standard 10-kw., three-phase transformer, stepping down from 2300 volts to 110 volts for lighting and power circuits, and a 25-kw. single-phase transformer to supply energy for operating the railway signal circuits, stepping up from 2300 volts to 4400 volts. Work is also progressing rapidly on the construction of forty-two 282-ton electric locomotives which are being built at Schenectady. Twelve of the locomotives are being geared for passenger service and the remainder are for freight service. All of the passenger and several of the freight locomotives will be equipped with oil-fired steam boilers for heating passenger trains. The first locomotive to be completed was shipped from the factory Sept. 25 and is now being exhibited at various points on the Chicago, Milwaukee & St. Paul system.

WILKES-BARRE, PA.—Plans have been completed by Sturdevant & Poggi, architects, Coal Exchange Building, Wilkes-Barre, for the construction of factory buildings, to cost $250,000, for the Lehigh & Wilkes-Barre Coal Co. Bids will be received by the architects for the work, consisting of machine shop, blacksmith shop, boiler and structural shop, car shop, wheelwright shop, oil sheds, etc., including wiring, steam heat, oil tanks and pumps, electric cranes and equipment.

WYOMISSING, PA.—The Borough Council has passed over the veto of Burgess Heber Yost the ordinance providing an appropriation of $10,000 for the purchase of lighting equipment for the borough.

BEACH HAVEN, N. J.—Syd Verts, engineer and electrician, Beach Haven, would like to receive prices and information on equipment (second-hand) for a 7-kw. to 10-kw., 110-volt direct-current (directly connected) steam-driven electric generating plant; also on storage-battery unit, 110 volts, with capacity of at least 100 amp.-hr., and also on a 25-kw., 110-volt direct-current generating unit (directly connected).

MILTON, DEL.—Plans are being considered for the construction of a municipal electric-light plant in Milton.

WILMINGTON, DEL.—The Wilmington & Philadelphia Trac. Co., Wilmington, has purchased the property of the Wilmington, New Castle & Delaware City Ry. Co., which gives it the control of all the electric railways in Delaware. The storage-battery service on the Delaware City line will be abandoned and overhead trolley restored.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Foreign and Domestic Commerce in the Commerce Reports as follows: No. 18,682—A letter to the bureau from a business man in Argentina states that he desires to purchase copper and brass tubes direct from manufacturers. Three lists, two in German and one in Spanish, as well as descriptions of the tubes wanted, accompany the letter and may be examined at the bureau or its branch offices. No. 18,807—The bureau has been informed by a business man in this country that a correspondent in Greece desires quotations on insulated switchboard cable for telephone apparatus and single insulated wire, specifications for which may be examined upon application to the bureau's informant. No. 18,815—The commercial attaché of the Department of Commerce in France states that an electrical supply firm in that country desires to communicate with American manufacturers or exporters of electric-light carbons for street lighting. No. 18,860—A commission agent in Spain has informed an American consular officer that he desires to represent American manufacturers of ice-making and refrigerating machinery. Catalogs and communications should be in Spanish. No. 18,870—The bureau is informed by an American consular officer in Paraguay that a firm desires to receive prices on machinery and appliances desired for the installation of an electric-lighting plant. A list of articles desired, together with additional information, may be obtained upon application to the bureau or its branch offices. No. 18,881—A commission house in Uruguay has informed an American consular officer that it desires to represent American manufacturers of electric cables and wires, lamps, meters and transformers, machines and stationary and semi-stationary boilers of from 50 hp. to 500 hp. for electric plants, and internal-combustion petroleum motors; iron in general, steel in bars and sheets, galvanized plate and artisans' tools. Correspondence may be in English, but Spanish is preferred. No. 18,892—An American consular officer in Canada reports the desire of a firm in his district to receive catalogs and price lists of vacuum sweepers. No. 18,899—A business man in Norway has informed an American consular officer that he desires to communicate with American manufacturers or exporters of vulcanized (stranded) cable. The quality must conform to 1911 code in the United States. Principal size used is 1.5 mm. (0.059 in.) square. Correspondence may be in English. Further information may be obtained upon application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., and its branch offices.

North Central

DETROIT, MICH.—An addition (providing for 250 rooms) will be erected by the owners of the Hotel Statler, increasing the capacity of hotel to 1000 rooms. Considerable electrical equipment will be required.

DETROIT, MICH.—The State Railroad Commission has authorized the Detroit, Pontiac & Owosso Ry. Co. to issue $3,500,000 in bonds to provide funds for the construction of an electric railway from Detroit to Owosso.

MIDLAND, MICH.—The local electric-light plant, owned by the Bristol El. Lt. Co., has been purchased by the Consumers' Pwr. Co., Saginaw. The Consumers' company will enlarge and extend the system and make some changes in the street-lighting service. A transmission line will be erected from Bay City to Midland to transmit energy generated at its plant on the Au Sable River. The Midland plant will be operated as part of the Saginaw Valley system.

CINCINNATI, OHIO.—Plans have been prepared by Elzner & Anderson, architects, Ingalls Building, Cincinnati, for the erection of five new buildings for the Children's Home at Madisonville, to cost about $100,000, including a power building. Considerable electrical equipment will be required in connection with the buildings.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, Ohio, until Nov. 3, for tungsten-filament or Mazda lamps to the extent of $10,000. Specifications may be obtained at the above office.

MIDDLETOWN, OHIO.—Plans are being considered for the installation of electric lamps on the new bridge between Middletown and New Middletown.

NEY, OHIO—The installation of an electric-lighting system in Ney is under consideration.

STEUBENVILLE, OHIO.—The City Council has awarded the contract for street lighting to the Steubenville & East Liverpool Ry. & Lt. Co. for a period of ten years. The contract provides for a considerable amount of new construction work in the near future.

YOUNGSTOWN, OHIO.—The Mahoning & Shenango Ry. & Lt. Co., Youngstown, is contemplating extending its lines from New Castle to Beaver Falls, Pa.

BLOOMINGTON, IND.—Bids will be received by the Board of Trustees of Indiana University, at the office of R. P. Daggett & Co., 956 Lemcke Annex, Indianapolis, until Dec. 1 for the construction of a gymnasium for the University of Indiana, Bloomington. Separate bids will be received as follows: For general contract, heating and ventilating, plumbing, and electric wiring. Plans and specifications are on file at the office of the architects and at the office of John W. Graves, secretary of board of trustees, Bloomington.

FORT WAYNE, IND.—The Board of Public Works has approved the resolution for establishing an ornamental lighting system on Lincoln Avenue from Broadway to Indiana Avenue. Permission has been granted to Hilgemann & Schaaf, promoters of Harrison Hill, to install an ornamental lighting system on Harrison Boulevard. The system, after completion, will be turned over to the city.

GOSHEN, IND.—The Public Service Commission has granted the Hawks El. Co., Goshen, permission to issue $32,500 in bonds and $10,000 in capital stock, the proceeds to be used for the construction of a new unit in its plant in Goshen. The proposed addition will consist of a brick building and a 600-hp. boiler, switchboard, exciter and other necessary equipment, to cost about $40,000.

GRANDVIEW, IND.—Preparations are being made by the Rockport Wtr. Wks. Co., Rockport, to extend its transmission line to Grandview to furnish electrical service. About 15 miles of No. 6 bare wire and 30-ft. (6-in.-top) poles will be required for the line, for which bids have already been asked. A. H. Kennedy, Rockport, is engineer in charge.

MONTICELLO, IND.—The County Commissioners are negotiating with the Interstate Public Ser. Co. with a view of contracting with the company for electrical service at the county farm.

SHOALS, IND.—The Public Service Commission has authorized the Shoals Utilities Company to issue $27,500 in capital stock, the proceeds to be used for improvements to the electric-light plant and waterworks system.

WINSLOW, IND.—Local business men are negotiating with the Evansville Pub. Ser. Co., Evansville, to extend its electrical service from Ayrshire to Winslow. A. C. Blinn, Evansville, is manager of the company.

HAMILTON, ILL.—Rights-of-way are being secured for the erection of a transmission line from Hamilton to Carthage, a distance of 12 miles. Over this line the Mississippi River Pwr. Co., Keokuk, Iowa, will supply electricity to the Central Illinois Pub. Ser. Co., which serves the city of Carthage.

LINCOLN, ILL.—Bids will be received until Nov. 15 by the Board of Administration, Capitol Building, Springfield, for erection of employees' building to replace building destroyed by fire at the Lincoln State School and Colony, Lincoln. Separate contracts will be awarded on the general work, plumbing, heating and electric wiring. Plans and specifications may be obtained upon application to James B. Dibelka, state architect, 130 North Fifth Avenue, Chicago.

PEORIA, ILL.—Plans are being considered for the installation of an ornamental street-lighting system on Jefferson Avenue from Hamilton Street to Camden Avenue.

RUSHVILLE, ILL.—The City Council is considering plans for improving the electric-lighting system.

EAU CLAIRE, WIS.—The Wisconsin-Minnesota Lt. & Pwr. Co., Eau Claire, it is reported, has started work on construction of a large power dam on Chippewa River at Paint Creek in connection with a hydroelectric power plant The plans provide for the development of about 50,000 hp. at a cost of $2,000,000. A. Guthrie & Co., St. Paul, it is reported, have contract for construction of dam. A. E. Pierce, Eau Claire, is vice-president.

MILWAUKEE, WIS.—The Milwaukee El. Ry. & Lt. Co. is planning to extend its electric transmission line to Merton and Lake Five.

MILWAUKEE, WIS.—The Department of Public Works has awarded the contract for installation of an experimental street-lighting circuit for the city to the Langstadt & Meyer Construction & Supply Co., Appleton, at $12,490; to Julius Andrae Co., Milwaukee, for wires and cables, at $8,000, and to Kuhlman El. Co., for transformers, at $2,000.

RACINE, WIS.—The Sixth Street merchants have petitioned the City Council to replace the five-lamp clusters with single-standard lamps on that thoroughfare. The lighting committee of the Council is considering entering into a contract with the Milwaukee Lt., Ht. & Trac. Co. for lighting other streets in the city.

SALEM, WIS.—Work will soon begin, it is reported, on the installation of an ornamental street-lighting system in Salem.

BERTHA, MINN.—The Bottemiller Co., Bertha, recently granted a franchise to supply electricity here, is building a power plant adjoining its mill. The equipment will include one 100-hp. Babcock & Wilcox boiler, one 125-hp. Corliss engine, one Ideal 25-kw. direct-current generator and switchboard. Four miles of wire and 100 30-ft. poles will be required for the overhead system. The Globe El. Co., Milwaukee, Wis., has the contract for the work. George J. Portman, Bertha, is engineer in charge of the work.

DULUTH, MINN.—Work has begun on the construction of a new substation at Smithville for the Duluth Street Ry. Co. The new station will cost about $25,000 and will supply energy for the proposed extension of the street-car line to Morgan Park.

ELY, MINN.—Bonds to the amount of $40,000 have been voted, the proceeds to be nused for improvements to the municipal electric-light plant and system.

RAYMOND, MINN.—At an election held recently bonds were authorized for the construction of a municipal electric-light plant in Raymond.

ST. PAUL, MINN.—Bids will be received by State Board of Control, State Capitol Building, St. Paul, until Nov. 16 for construction of the Historical Society Building at St. Paul, including the general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications prepared by C. H. Johnston, architect, Capital Bank Building, St. Paul. Copies of plans and specifications may be seen at the St. Paul and Minneapolis Builders' Exchanges, at the office of the Board of Control, and at the office of the architect.

CEDAR RAPIDS, IOWA.—The Iowa Railroad Commission has granted its approval of a franchise for the erection of an electric-transmission line by the Iowa Pwr. & Lt. Co., Cedar Rapids, from Cedar Rapids to Shellsburg, a distance of 15 miles.

FAIRBANK, IOWA.—At an election to be held Nov. 1 the proposal to issue $6500 for the installation of a municipal electric-lighting system will be submitted to the voters.

KEOKUK, IOWA.—Arrangements have been made by the directors of the Industrial Association for the erection of an electric plant on the Daley tract to supply energy to the plant of the tire company now building and to other industries that might locate in that immediate vicinity. Electricity for the smelter plant to be established on the tract will be supplied by the Mississippi Pwr. Co.,

Keokuk. The building will be erected by the Keokuk El. Co., Keokuk.

ORIENT, IOWA.—The Council is considering the installation of a municipal electric-lighting system in Orient, to cost about $7,000. It is proposed to secure electricity from the municipal electric-light plant at Greenfield.

SOLDIER, IOWA.—Plans are being considered for the installation of an electric-lighting system in Soldier, to cost about $8,000.

CONCEPTION JUNCTION, MO.—At an election held Sept. 28 the proposal to grant T. W. Costello, Conception Junction, an electric-lighting franchise and a street-lighting contract was carried.

ST. JOSEPH, MO.—At an election held recently the proposal to issue bonds to purchase additional equipment for the municipal electric plant was defeated. Charles D. Fox is superintendent of municipal plant.

ELGIN, N. D.—The village of Elgin has granted C. L. Rausch, Holdingford, Minn., a franchise to construct and operate an electric-light plant here for a period of 20 years. The Village Board has also contracted for the installation of an ornamental street-lighting system.

MEDINA, N. D.—Plans are being considered, it is reported, for the installation of an electric-light system in Medina.

PLYMOUTH, NEB.—The question of securing electric-lighting service for the village of Plymouth is under consideration by the Commercial Club.

LAWRENCE, KAN.—Work will soon begin on the construction of the new Bowersock elevator in North Lawrence. The elevator will be driven by electricity supplied by the plant of the Bowersock Mills & Pwr. Co.

PRESTON, KAN.—The proposal to establish a municipal electric-light and power plant in Preston will be submitted to the voters.

Southern States

HICKORY, N. C.—The city of Hickory has rejected all bids submitted for electric light and power franchise. It is understood that new bids will be called for. S. C. Cornwell is city manager.

MAIDEN, N. C.—Bonds to the amount of $3,500 have been voted for the installation of an electric-lighting system. Electricity for operating the system, it is reported, will be obtained from the transmission system of the Southern Pwr. Co., Charlotte.

SALISBURY, N. C.—The Board of Aldermen is considering a proposal submitted by the North Carolina Public Service Co. for lighting the new territory recently taken into the city limits.

SPRAY, N. C.—Condemnation proceedings have been taken by the Southern Pwr. Co., Charlotte, to secure the right-of-way for the erection of an electric transmission line to supply electricity to the mills at Spray.

GREAT FALLS, S. C.—The Republic Cotton Mills, it is stated, will increase their capital stock from $600,000 to $1,200,000, the proceeds to be used to enlarge the plant. The plans provide for the construction of a 40,000-spindle and 1000-loom mill, 300 houses for operatives and other buildings, lighting and sewerage systems. Contracts for the entire work, including machinery, it is reported, will be awarded within 30 days. The present plant of the company is operated by electricity.

GREENVILLE, S. C.—The installation of a municipal electric-light plant in Greenville is reported to be under consideration.

ACWORTH, GA.—The City Council is reported to be considering improvements to the municipal electric-light plant and waterworks system.

GRAYMONT, GA.—The town of Graymont has engaged W. Hopson Goodloe, Macon, to prepare plans and supervise the installation of a municipal electric-lighting system, for which $5,000 in bonds were recently authorized. The construction of a central power plant to supply electricity to the towns of Graymont and Summit (which are only a mile apart) is under consideration.

SUMMIT, GA.—W. Hopson Goodloe, Macon, has been engaged to prepare plans and supervise the installation of an electric-lighting system in Summit, for which $5,000 in bonds were recently voted. It is expected that the towns of Graymont and Summit, which are only a mile apart, will combine and build a central station to supply electricity in both places.

OCALA, FLA.—The Florida Pwr. Co., it is reported, has engaged W. H. Warnock to make surveys for the proposed high-tension system branching from the line near Istachatta to Orlando, a distance of about 67 miles.

CAMDEN, TENN.—A new company has been organized under the name of the Camden El. Lt. Co. to take over the property and holdings of the old company and rebuild the electric-light plant that was destroyed by fire. John D. Rice and Wade Lowry are interested in the company.

McMINNVILLE, TENN.—The Mead & De Bard water-power, it is reported, has been purchased by the city of McMinnville, including saw and grist mills, about 20 acres of land and several tenement houses. The city proposes to use the power to operate the municipal electric-light plant and water-works system.

PARKSVILLE, TENN.—The Tennessee Pwr. Co., Chattanooga, has started work on the construction of a steam-driven power station in Parkville. The plant will have an initial output of 10,000 hp.

YELLVILLE, ARK.—The city of Yellville has granted W. C. Stephenson, Marshall, a franchise to construct and operate an electric-light, power and ice plant in Yellville.

MANDEVILLE, LA.—The Town Council has awarded to the St. Tammany-New Orleans Ry. Co. a contract for lighting the streets of the town for a period of five years.

RAYVILLE, LA.—The town of Rayville has purchased the local electric plant formerly owned by the People's Lt. & Pwr. Co., to be owned and operated by the municipality. The purchase price was $12,000.

PADEN, OKLA.—The proposal to grant an electric-light franchise to A. G. Rogers and W. E. Davis will be submitted to the voters on Nov. 23.

FORNEY, TEX.—The capital stock of the Forney Wtr., Lt. & Ice Co. has been increased from $20,000 to $25,000.

SILSBEE, TEX.—The Silsbee Ice Mfg. Co. has filed amendments to its charter changing its name to the Silsbee Ice, Lt. & Pwr. Co. and increasing its capital stock from $40,000 to $50,000. The company proposes to operate an electric light and power plant.

Pacific States

EVERETT, WASH.—Claims for water rights on Jim Creek and Stillaguamish River have been filed with the county clerk of Snohomish County by A. D. Butler, Seattle. Mr. Butler has also filed claims on other streams where power might be developed, including the Sauk River. He proposes to utilize 3000 cu. ft. per second from the Stillaguamish River and 1000 cu. ft. per second from Jim Creek. Work, it is understood, will soon begin upon the development of the sites.

MANSFIELD, WASH.—The Council has passed an ordinance granting the Okanogan Valley Pwr. Co., Brewster, permission to extend its transmission lines to Mansfield.

PORT TOWNSEND, WASH.—The City Council is considering the question of purchasing the plant of the Key City Lt. & Pwr. Co., to be owned and operated by the municipality.

SEATTLE, WASH.—The contract for the electrical work on the city bridge over the government canal at Lake Washington at Fifteenth Avenue Northwest, has been awarded by Hans Pederson, general contractor, Alaska Building, Seattle, to the Westinghouse El. & Mfg. Co., at $13,000.

SPOKANE, WASH.—Property owners on Trent Avenue have presented a petition to the City Council asking for the installation of electric lamps on that thoroughfare from Lincoln to Division Street.

ASHLAND, ORE. — The California-Oregon Pwr. Co., it is reported, is making preparations for the construction of a new substation in Ashland, to replace the one destroyed by fire last January. The new building will be erected on Nevada Street and will cost about $16,000.

PRAIRIE CITY, ORE.—Arrangements, it is understood, are being made with the Prairie City Lt. & Pwr. Co. to supply electricity for the Empire Dredging & Pwr. Co., which will start operations on Canyon Creek some time after the first of the year. The transmission lines are to be erected to John Day River, at a cost of about $60,000.

BURBANK, CAL.—The City Council is considering the installation of an electrolier lighting system in Burbank.

QUINCY, CAL.—Preparations are being made to increase the output of the Quincy El. Lt. & Pwr. Co. New equipment, including a new 100-kw. generator and a new waterwheel, will be installed. The capacity of the reservoir above the canyon will be increased. H. G. Flournoy is interested in the company.

SAN BRUNO, CAL.—The residents of San Bruno have voted to establish a lighting district.

SAN JOSE, CAL.—Plans are being considered for the installation of an ornamental street-lighting system on North First Street.

BLACKFOOT, IDAHO.—The City Council has engaged James Young, engineer, to investigate power sites on Blackfoot River, where the city is contemplating building a municipal electric light and power plant. If a favorable report is given on the project, it is understood that work will be started shortly after the first of the year.

SALT LAKE CITY, UTAH.—Plans have been completed for the erection of a terminal station in Salt Lake City, to cost $250,000, for the joint use of the Salt Lake & Ogden Ry. Co. and the Salt Lake & Utah R. R. Co., both of which operate electric interurban lines. W. R. Armstrong is chief engineer.

POLSON, MONT.—J. H. Cline, Polson, has been granted a power permit by Secretary Lane of the Department of the Interior, Washington, D. C., for the installation of a hydroelectric plant at Big Creek in the Kalispell land district. The proposed plant will supply electricity in Polson and surrounding territory.

FORT COLLINS, COL.—The installation of an ornamental lighting system in Fort Collins is under consideration.

LIMON, COL.—Application has been made to the City Council by Denver capitalists for a franchise to install and operate an electric-light plant in Limon.

Canada

EDMONTON, ALTA.—A by-law authorizing the city of Edmonton to enter into a contract with G. W. Farrell & Co., 43 St. Francois Xavier Street, Montreal, Que., for the supply of electrical energy will be submitted to the ratepayers. It is proposed to build a hydroelectric plant on North Saskatchewan River, 60 miles above Edmonton, to cost about $6,000,000. Preliminary plans have been prepared by R. S. Kelsch, consulting engineer, 83 Craig Street, West Montreal. C. Cox is clerk.

WANETA, B. C.—Work has begun by the Waneta Development Co. on the construction of a hydroelectric power plant at Waneta, to develop 80,000 hp. The proposed plant will be located at the conflux of the Pend Oreille and Columbia Rivers, in British Columbia.

CARDINAL, ONT.—The large electric generator at the electric plant of the Canadian Starch Co., Cardinal, was destroyed recently by an explosion.

ELMA, ONT.—The Township Council is considering the installation of a distributing system for hydroelectric power.

GALT, ONT.—The City Council is contemplating the installation of an ornamental street-lighting system, to cost about $6,860.

HENSALL, ONT.—Plans are being considered by the Town Council for the installation of hydroelectric power and lighting systems.

NEW TORONTO, ONT.—The Hydro-Electric Commission has authorized an extension of the system on Fifteenth Street from the Lake Shore Road to Birmingham Avenue.

PORCUPINE, ONT.—Plans are being considered, it is reported, by the Northern Canada Pwr. Co. to increase the output of its plant, involving an expenditure of about $1,000,000.

SMITH'S FALLS, ONT.—Plans are being considered by the Rideau Pwr. Co. for the installation of two additional generating units to complete its plant in Smith's Falls.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer for the Panama Canal, Washington, D. C., until Nov. 10 for galvanized steel or iron, spring steel, steel drill rods, wire cable, wire, joining shackles, missing links, cable clips, reamers, twist drills, sheet copper, sheet brass, bronze bars, yellow metal, zinc plate, solder, lead pipe, etc. Blanks and general information relating to this circular (No. 985) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 19, 1915.

[Prepared by Mitchell & Allyn, 41 Park Row, New York.]

1,156,874. SUCTION CLEANER; E. M. Barnes, Hastings, Mich. App. filed June. 10, 1913. Fan and motor mounted as unit in the cleaner.

1,156,885. OUTLET-BOX BRACKET; J. C. Caine, Denver, Col. App. filed Dec. 12, 1911. Adjustably supports outlet box.

1,156,887. ELECTRIC SWITCH, FUSE AND PROTECTOR THEREFOR; E. Charpier, Chicago, Ill. App. filed Feb. 13, 1914. Renewable fuses, locked switch.

1,156,898 PROCESS OF MAKING SHEET-METAL DOORS, PARTITIONS AND THE LIKE; J. H. Gravell, Philadelphia, Pa. App. filed Dec. 16, 1912. Facing plates are welded to intermediate transverse spaces.

1,156,906. RADIATOR SHIELD; E. W. Kelly, Philadelphia, Pa. App. filed Nov. 18, 1912. Protection from X-rays.

1,156,964. ELECTRICITY METER; R. Ziegenberg, Berlin-Schoeneberg, Germany. App. filed April 16, 1913. Commutator for multiple-pole meter.

1,156,967. ELECTRIC INCANDESCENT LAMP; A. E. Appleyard, Ashland, Wis. App. filed Feb. 13, 1914. Filament shaped to form a letter.

1,156,987. AUTOMATIC ELEVATOR CONTROL; E. L. Dunn, Worcester, Mass. App. filed Sept. 12, 1913. Improved floor indicator.

1,157,011. ELECTRIC APPARATUS FOR MOTOR VEHICLES; H. W. Leonard (deceased), Bronxville, N. Y. App. filed Jan. 18, 1910. Storage-battery lighting system.

1,157,012. CIRCUIT-CONTROLLING DEVICE; M. Levison, Chicago, Ill. App. filed Sept. 6, 1912. Annunciator operates upon maintenance of certain conditions.

1,157,014. DYNAMO-ELECTRIC MACHINE; H. Lippelt, New York, N. Y. App. filed Sept. 1, 1911. Sparkless commutation.

1,157,018. TELEPHONE-EXCHANGE SYSTEM; F. R. McBerty, New Rochelle, N. Y. App. filed Aug. 9, 1909. Rapid, semi-mechanical. (Fifty claims.)

1,157,024. DYNAMO-ELECTRIC MACHINE; H. McQuillin, Chicago, Ill. App. filed March 13, 1914. Axial movement of armature cuts storage battery into circuit.

1,157,026. PLUG SWITCH; W. F. Meschenmoser, New Dorp, N. Y. App. filed Oct. 20, 1911. Terminals protected against the pulling strain.

1,157,028. MECHANISM FOR REGULATING THE CHARGING RATE OF STORAGE BATTERIES; W. Noble, Orchard Lake, Mich. App. filed Nov. 23, 1911. Charging rate is varied as charging progresses.

1,157,036. INSULATOR-SUPPORTING FIXTURE; C. L. Pierce, Jr., Pittsburgh, Pa. App. filed Aug. 8, 1914. For primary and secondary wires and alternating-current supply circuit.

1,157,037. INSULATOR-SUPPORTING STRUCTURE; C. L. Pierce, Jr., Pittsburgh, Pa. App. filed Aug. 8, 1914. Insulator bracket formed of sheet metal.

1,157,040. TELEGRAPH TRANSMITTER; E. H. Piersen, Topeka, Kan. App. filed Dec. 17, 1912. Characters may accumulate and may be sent by the motor in proper sequence. (115 claims.)

1,157,051. DEVICE FOR PROTECTING INDUCTION MOTORS AND THE LIKE; E. O. Schweitzer, Chicago, Ill. App. filed Aug. 3, 1912. Protected against improper connection.

1,157,057. METAL CAP FOR ELECTRIC INCANDESCENT LAMPS; E. Strehler, Stein, Switzerland. App. filed May 9, 1912. Cap connected by insulating material deformable in a cold state.

1,157,066. REACTOR; P. Torchio, New York. App. filed April 24, 1914. Helical coils with inside air space.

1,157,075. ELECTRIC-LAMP SOCKET; C. D. Blackburn, Lime, Col. App. filed April 21, 1914. Has terminal wires sharpened into penetrating points.

1,157,076. ELECTRICAL SWITCH-ACTUATING MECHANISM; W. J. Bohan, St. Paul, Minn. App. filed Aug. 3, 1914. Controlled from cable.

1,157,094. TRANSMITTING AND RECEIVING SIGNALS; R. A. Fessenden, Washington, D. C. App. filed June 2, 1900. Non-interfering transmission and receiving.

1,157,100. ELECTRIC HEATING DEVICE; W. S. Hadaway, Jr., New York, N. Y. App. filed Sept. 5, 1911. Chocolate warmers.

1,157,102. SIGNAL; C. O. Harrington, Edgwood Borough, Pa. App. filed July 12, 1913. Railway lamps at higher intensity for day signaling.

1,157,104. BLOCK SIGNAL SYSTEM; L. A. Hawkins, Schenectady, N. Y. App. filed Aug. 6, 1908. For electric railways; rails continuous.

1,157,105. LIGHTING SYSTEM FOR MOTOR VEHICLES; R. Head, New York, N. Y. App. filed Nov. 8, 1910. For gas lamps.

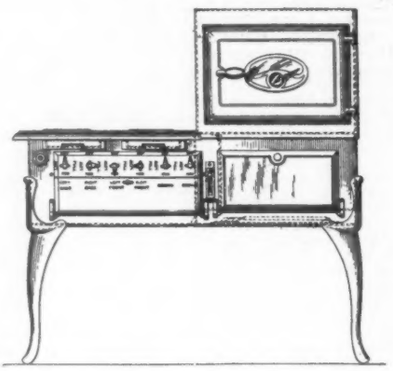
1,157,111. ELECTRIC-COOKING RANGE; W. J. Keep, Detroit, Mich. App. filed Dec. 26, 1914. Cooking top, main oven, broiler and warming oven.

1,157,112. THERMO-ELECTRIC HEAT-REGULATING SYSTEM; L. A. Larson, Minneapolis, Minn. App. filed Feb. 16, 1914. Thermally controlled draft-regulating motor.

1,157,134. LIQUID RHEOSTAT; D. Welge, South Porcupine, Ontario, Canada. App. filed Dec. 16, 1914. Single tank; for three-phase motors.

1,157,137. DYNAMO-ELECTRIC MACHINE; R. B. Williamson, Milwaukee, Wis. App. filed July 28, 1911. Noise of operation is diminished.

1,157,179. CENTRIFUGAL CIRCUIT-CHANGING DEVICE FOR ELECTRIC MOTORS; E. S. Pillsbury, St. Louis, Mo. App. filed Feb. 23, 1915. Stops limit outward movement of centrifugal weights.



1,157,111—Electric-Cooking Range

1,157,181. ELECTRIC SOCKET; F. M. Rosenfeld, New York, N. Y. App. filed March 1, 1915. Cheap construction for tree lighting, etc.

1,157,203. CONTROL SYSTEM FOR ELECTRIC MOTORS; H. L. Beach, Edgwood Park, Pa. App. filed June 9, 1914. Automatic acceleration.

1,157,208. ELECTRIC CABLE; J. L. Conrad, Durham, N. C. App. filed Dec. 8, 1914. Has a detector circuit.

1,157,233. WATER-PURIFYING DEVICE; L. C. Lashmet, Jacksonville, Ill. App. filed Nov. 14, 1914. Electrolyzing device, aerating means and settling tank.

1,157,239. CUT-OUT PULLEY; A. C. McWilliams, South Bend, Ind. App. filed May 21, 1914. Mechanically and electrically simple.

1,157,271. STABLE BORON NITRIDE AND THE PROCESS OF MAKING THE SAME; George Weintraub, Lynn, Mass. App. filed Feb. 3, 1913. Boron nitride stable with respect to hot water.

1,157,277. MOTOR CONTROLLER; C. W. Yerger, Milwaukee, Wis. App. filed June 22, 1911. For passenger or freight elevators.

1,157,280. DRAWN ELECTRODE; W. G. Abbott, Jr., Milford, N. H. App. filed April 24, 1912. Mild-steel sheath with magnetite filling.

1,157,281. APPARATUS FOR PRODUCING DIRECTIVE FORCES BY INDUCTION IN ALTERNATING-CURRENT CIRCUITS; H. Abraham, Paris, France. App. filed Feb. 24, 1912. For measurement of resistance, frequency, etc.

1,157,292. AUTOMOBILE HORN; H. A. Bretz, Jackson, Mich. App. filed. Dec. 28, 1914. Of very compact construction.

1,157,293. APPARATUS FOR THE MANUFACTURE OF CHEMICAL COMPOUNDS; C. J. Brockbank, Niagara Falls, Ontario, Canada. App. filed Jan. 7, 1914. Sulphuric acid by catalytic process.

1,157,296. ELECTRICAL SIGNAL DEVICE; A. H. Caven, Youngwood, Pa. App. filed May 7, 1914. Automatic block signal.

1,157,310. ELECTRIC SWITCH; C. J. Klein, Milwaukee, Wis. App. filed April 8, 1912. Two-button flush switch.

1,157,313. ELECTRIC MOTOR CONTROL; M. C. A. Latour, Paris, France. App. filed Feb. 23, 1909. Transition from operation as repulsion motor to series motor.

1,157,325. DYNAMO-ELECTRIC MACHINE; M. Osnos, Berlin, Germany. App. filed March 8, 1913. For fundamental periodicity or double the same.

1,157,336. HIGH-POTENTIAL SWITCHING SYSTEM; C. P. Steinmetz, Schenectady, N. Y. App. filed Jan. 28, 1913. Energizes line before it is directly switched in.

1,157,343. ELECTRICALLY HEATED TOOL; W. I. Thompson, Stoneham, Mass. App. filed Feb. 5, 1915. For boots and shoes.

1,157,344. MEANS FOR PREVENTING CORONA LOSS; E. Thomson, Swampscott, Mass. App. filed Dec. 28, 1912. Non-metallic sheath and conductor.

1,157,392. TROLLEY CONDUCTOR; W. Hoopes and T. Varney, Pittsburgh, Pa. App. filed July 17, 1914. Catenary suspension.

1,157,393. TROLLEY CONDUCTOR; W. Hoopes and T. Varney, Pittsburgh, Pa. App. filed July 17, 1914. Composite construction, catenary type.

1,157,394. TROLLEY CONDUCTOR; W. Hoopes and T. Varney, Pittsburgh, Pa. App. filed July 17, 1914. Catenary type for high-speed railways.

1,157,395. PORTABLE ELECTRIC LIGHT; C. Huber, Chatham Borough, N. J. App. filed Dec. 16, 1914. Has series of tubular cells placed end to end.

1,157,396. SELECTIVE SIGNALING SYSTEM; J. A. Hulit, Chicago, Ill. App. filed Oct. 3, 1912. Selectors operated by impulses of one polarity.

1,157,414. DYNAMO-ELECTRIC MACHINE; A. H. Neuland, Bergenfield, N. J. App. filed Feb. 3, 1914. Shunts the lines of force in accordance with speed.

1,157,463. CATENARY STRUCTURE; T. Varney, Pittsburgh, Pa. App. filed July 17, 1914. Secures bracing effect with two-messenger cables.

1,157,464. INCANDESCENT ELECTRIC LAMP; C. A. Vetter, Pittsburgh, Pa. App. filed July 31, 1913, renewed Jan. 7, 1915. Has locking means for the lamp.

1,157,497. HAND-HOLE COVER FOR GENERATORS; W. L. Bliss, Niagara Falls, N. Y. App. filed Jan. 9, 1912. Provides ready access to commutator of car-lighting generator.

1,157,508. SIGNAL BELL; J. Charland and R. A. O'Connor, Copper Cliff, Ontario, Canada. App. filed Sept. 5, 1914. Single-stroke, solenoid-operated.

1,157,531. MANUFACTURE OF DRY BATTERIES FOR FLASHLIGHTS AND OTHER PURPOSES; F. D. Harper, Everett, Mass. App. filed Feb. 19, 1914. Parts may be stored and cell rendered active when desired.

1,157,561. AUTOMOBILE SIGNAL; G. F. A. McDougall, Boston, Mass. App. filed Sept. 11, 1914. Automatic direction signal.

1,157,592. ELECTRIC MACHINE; J. E. Seeley, Los Angeles, Cal. App. filed Jan. 27, 1913. Oscillation circuit for X-ray purposes.

1,157,601. BURGLAR-ALARM SYSTEM; S. D. Tomaso, Chicago, Ill. App. filed March 26, 1915. Phonograph sends out alarm through telephone.

1,157,603. RAIL BOND; C. P. Vaill, Worcester, Mass. App. filed Aug. 28, 1912. Laminated conductor having sheaths welded to the solid ends thereof.

1,157,612. DIE FOR INSULATORS; C. Van D. Bennett, Victor, N. Y. App. filed June 9, 1913. Of the petticoat type.

1,157,625. ACCOUNTING SYSTEM; F. O. Heuser, Chicago, Ill. App. filed May 13, 1909. For time, wage and job cost. (154 claims.)

1,157,630. AUTOMATIC RETRIEVING TROLLEY; S. E. McFarland, Long Beach, Cal. App. filed June 1, 1912. Of simple and easily adjusted construction.

13,998 (reissue). SYSTEM OF CONTROL; N. W. Storer, Pittsburgh, Pa. App. filed April 15, 1914. (Original patent No. 1,056,852, filed March 25, 1913.) For single-phase railway motors by a liquid rheostat.